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ComputerNews

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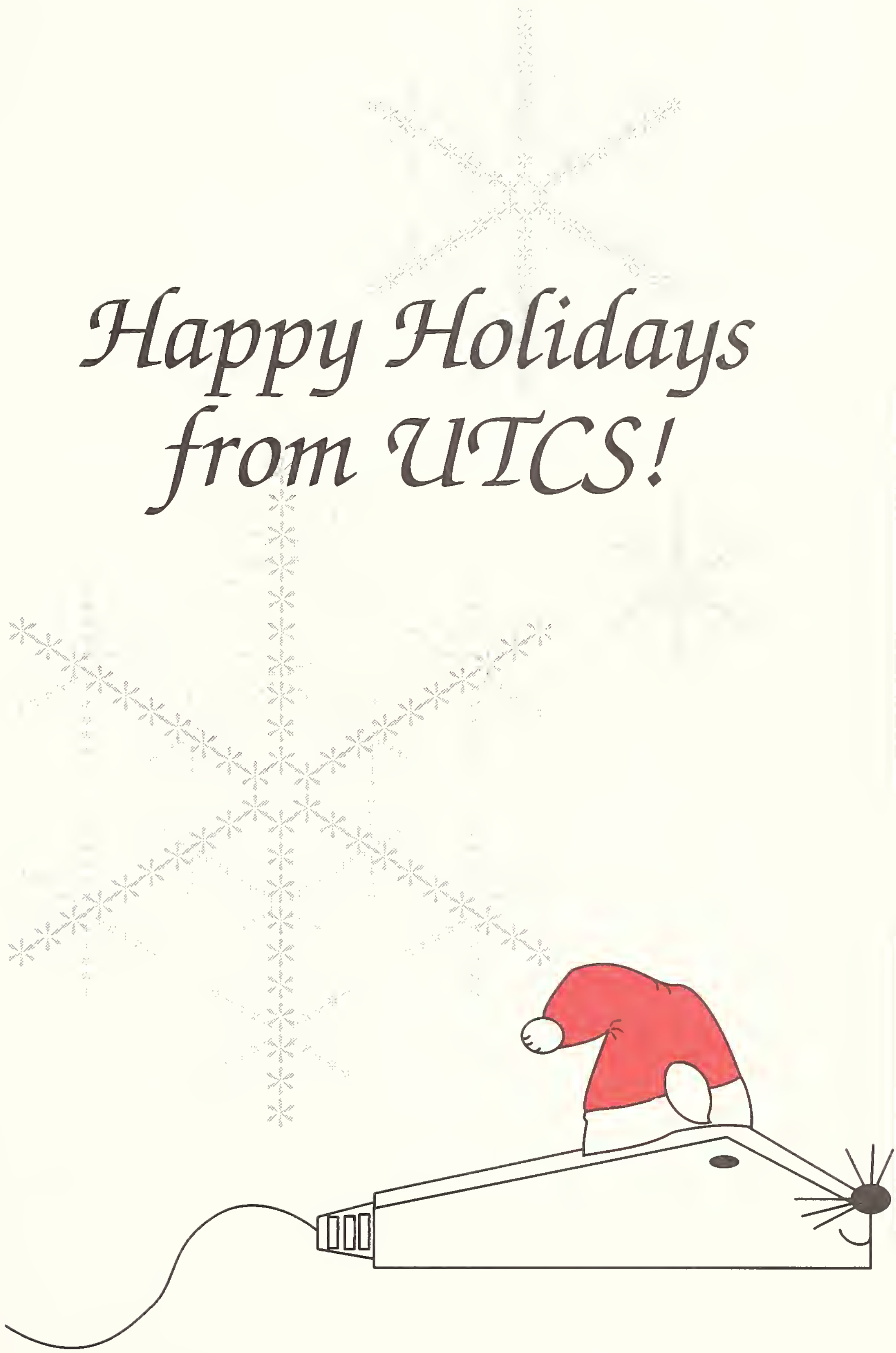

ISSN 0315-4661 November/December 1989 No. 259

Contents

Features

The Macintosh Portable and Macintosh IIci 1
Works of ARPP 3

Numerical and Scientific Software for Microcomputers

Introducing JMP: Exploratory Data Analysis on the Mac 7
SAS/FSP - What's in it for Me? 11
Spreadsheets for Science and Engineering 14
SAS News 17
SPSS News 17
Site License for NAg FORTRAN Library 18
Site License for Dynamical Systems Software 19
Numerical and Scientific Software News
  MathCad News 20
  Virtual Memory of GAUSS 22
  PC Magazine Evaluates Mathematical Toolboxes 22
  IMSL FORTRAN Libraries Available for Macintosh Computers 22

Reviews

Seybold Conference 1989: A Report 23
Educational Discounts for Microcomputer Software 27
Good News, WordPerfect Users, WordPerfect 5.1 is Coming 28
Microsoft Word 4.0 for the Macintosh 30
Publish it Yourself! 32
PageMaker and Images 34
Ihor's Unfamiliar Quotations (with apologies to Mr. Bartlett) 37
Microcomputer Short Courses 38

Departments

Documents at UTCS 39
Consulting and Enquiries 41
UTCS Directory 41
UTCS Terminal and Advising Sites 42
UTCS Services 43
UTCS Software List 44

Acknowledgements:

Thanks to Kristen Rosbak for her assistance in editing this issue.

Publisher
University of Toronto Computing Services
Toronto, Ontario
Canada M5S 1C1

Editor: Patricia Hood

Publications Assistant: Maureen Monné

Publication Date: *December 1, 1989*

Subscriptions
Subscriptions run for one year, beginning each January. Changes should be entered on the form at the back of this issue and mailed to *ComputerNews*, 4 Bancroft Avenue, Room 217 (or phone 416-978-4034). FAX: (416)978-7159.

ComputerNews is published eight times yearly by the University of Toronto Computing Services (UTCS). Enquiries should be directed to:

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Toronto, Ontario
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This newsletter was entirely produced on a Macintosh using PageMaker and other related Macintosh software.

The Macintosh Portable and the Macintosh IIci

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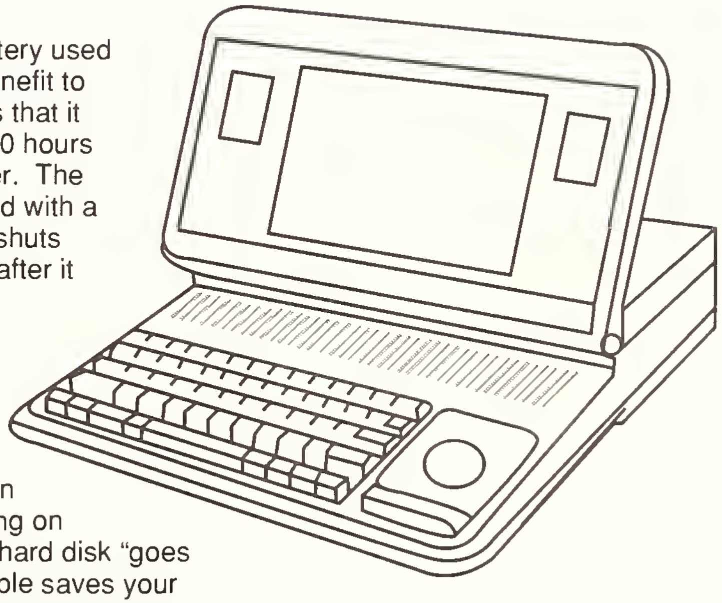
Apple Computer has recently introduced two new Macintosh models. Enhanced speed and portability are the principal features; unfortunately, they are not found on both machines. First, is the long-awaited Macintosh Portable. Second, is the Macintosh IIci, the fastest Macintosh to date. This article will highlight some of the most important features of both machines, but it is not intended to be a comprehensive hardware review.

The Macintosh Portable Computer is essentially an enhanced Macintosh SE. It is quite compact and less cumbersome to move around than previous Macs, but it's no speed demon. The central processing unit (CPU) used in the the Portable is an accelerated version of the CPU that Apple uses in all entry-level Macs: the Motorola 68000. The 68000 is not as powerful as the 68030 CPUs found in Macintosh SE/30 and Mac II-type machines. Also, the Motorola 68000 CPU will not be able to take full advantage of the advanced operating systems that Apple plans to release in the future.

The Portable weighs approximately 7.65 kg. At this weight, carrying the machine across campus is a considerable chore. The main culprit is the lead-acid battery used to power it. The benefit to the heavy battery is that it can provide up to 10 hours of continuous power. The Portable is equipped with a special chip which shuts the machine down after it has been idle for a prescribed length of time, thus eliminating unnecessary drain on the battery. If you are in the middle of working on something and the hard disk "goes to sleep," the Portable saves your work. The touch of a key activates the system again. This type of "sleep mode" is common in many portable and hand-held computers. The Macintosh Portable, however, includes a Desk Accessory that allows you to see the approximate charge left in the battery; this is possible because the battery drains gradually, unlike nickel cadmium (NiCd) batteries, which tend to shut down without warning. Traditional NiCd batteries also suffer from a problem known as "memory," whereby repeated recharging before the battery is fully drained can result in a reduction of the total amount of power the battery is able to store.



The Macintosh Portable

Fortunately, the Portable's lead-acid battery can be recharged without having to discharge it completely first.

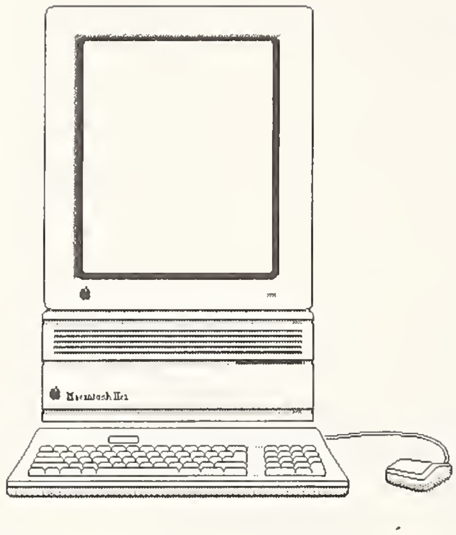
The Portable can be equipped with a 40MB hard disk, in addition to a 3.5 inch FDHD floppy drive. The FDHD drive is capable of reading Mac, MS-DOS, and Apple II formatted diskettes. One megabyte of random access memory (RAM) is provided with the machine; currently the maximum configuration is only 2MB.

All standard Macintosh connection ports are provided. Two internal expansion slots are also included (to accommodate a modem), along with a Processor Direct Slot. The Processor Direct Slot can be used for a read-only memory (ROM) card containing third-party software.

The standard pointing device on the Portable is a trackball, which can be positioned on either side of the keyboard for the convenience of both right-handed and left-handed users. The keyboard can be configured with an optional numeric keypad instead of the trackball. The package also includes a mouse, giving keyboard users full functionality.

The Portable has one of the clearest screens available on a portable machine. The active matrix liquid crystal display (LCD) is slightly larger than a regular Mac screen, but the contrast and brightness do not equal that of a black and white screen.

In summary, the Macintosh Portable offers a complete Macintosh system in a compact package about half the weight of the Macintosh SE, but at twice the price.



The Macintosh IIci

The other new model is the Macintosh IIci, the fastest member of the Macintosh family. Physically, it looks like the Macintosh IIcx. In benchmark tests, the new system performed, on average, 30-40 percent faster than the Macintosh IIcx. The speed increase is attributed to several new design options: the Motorola 68030 CPU running at 25MHz (a 67 percent speed increase over Mac II's), faster memory, and an optional RAM cache card (for exceptionally fast memory access). With the RAM cache card, the Macintosh IIci performed 50-60 percent faster that the Macintosh IIcx.

The new system features 512K ROM, the largest and most complex of any Macintosh system. Included in the ROM is 32-bit QuickDraw, for near photo-quality graphics; the ability to address 4 gigabytes (GB) of main memory; and support for future hardware. Additionally, a video interface for Apple High-Resolution Color and Apple Full-Page displays is included on board, thus saving one of the three expansion slots. All of these features make the Macintosh IIci ideally suited for speed-intensive applications and well equipped to take full advantage of new operating systems soon to be released by Apple.

Further questions regarding the Macintosh Portable and Macintosh IIci can be addressed by directing electronic mail to dabek@utcs.utoronto.ca, or by calling UTCS at 978-HELP.

Works of ARPP

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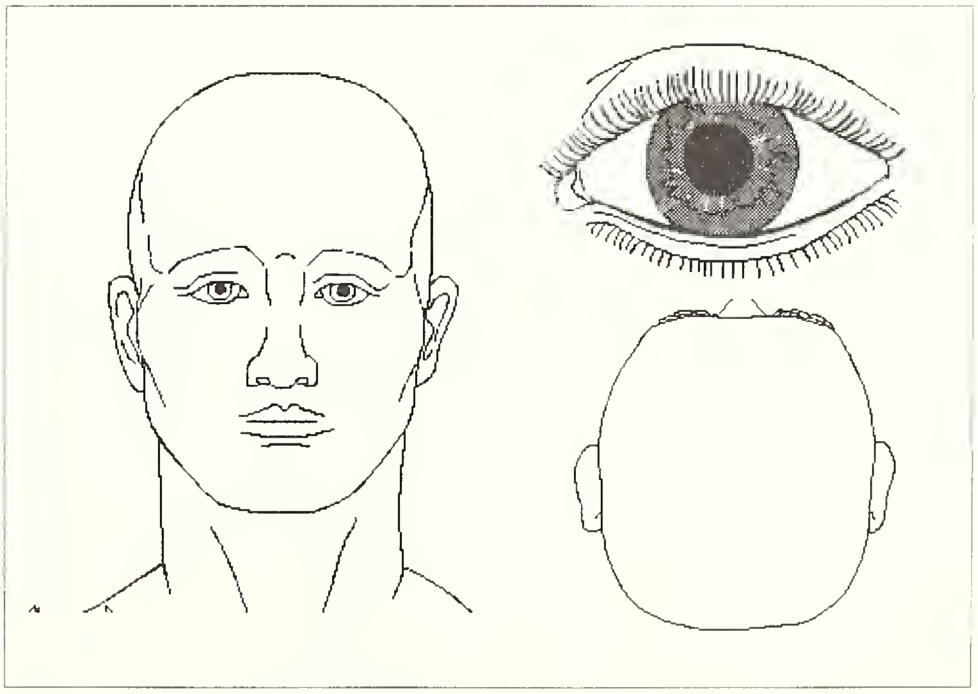
Since January of 1988, the University of Toronto, with other universities across Canada, has been a participant in the Apple Research Partnership Program (ARPP). Developed by Apple Canada, the program is designed to assist Apple researchers with their projects and to execute work of a more user-specific nature. The university finds students who are selected to become partners in the program. Apple provides resources in the form of technical manuals and a network called AppleLink, which enables those in the program to contact people at Apple in Toronto and California, and many vendors as well.

ARPP partners work with researchers to develop new applications on the Macintosh computer by investigating the technical capabilities of existing software and application-building tools. Frequently, they build a prototype, with the researcher, to demonstrate the feasibility of a larger project. Once this has been completed, the partners may continue to give computer technical advice, but it is the researcher who implements the ideas. ARPP partners tend to concentrate on a small number of projects each term.

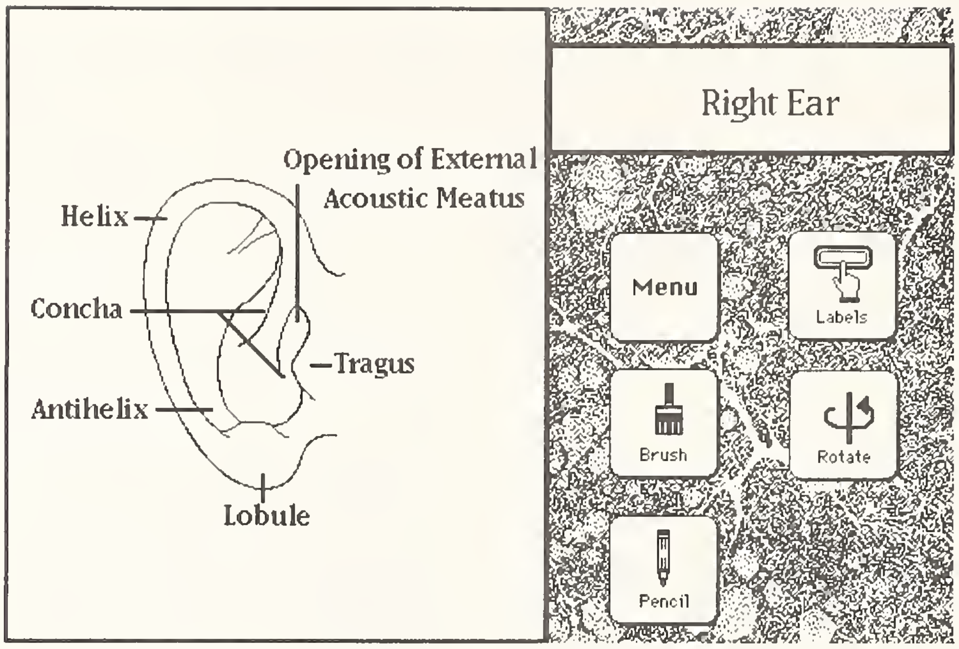
The partners hail from a variety of academic backgrounds; presently, there are five in the program. **Jennifer Boldt,** a student in the Art as Applied to Medicine program, is developing a prototype of a patient monitoring system with Dr. David Caspiri of Toronto General Hospital's Emergency Department. The aim of the project is to create a HyperCard stack which records basic personal information, injuries diagnosed and treatments administered while patients are at the emergency level. The tools of the program will include simple graphics, several data files, and patient cards.

Images created in MacPaint will aid in recording more precisely the location of an injury. The attending physician will be able to choose from illustrations of different views of areas of the body. Once he or she has located the picture for the general area, a skull for example, he or she has merely to lasso the more specific area, e.g. the left side of the jaw, copy and paste it into the patient's file, and then mark the location of the injury. Medical personnel will be able to save x-rays in these files as well.



Sample graphics from the prototype patient monitoring system Jennifer Boldt is developing with Dr. David Caspiri of Toronto General Hospital.

In order to accelerate response and treatment time, common injuries and illnesses will have their own specific data files; thus, it will be a matter of simply pushing a few buttons to call up a list of physicians who treat particular types of injuries, or drugs commonly administered for certain types of illnesses. Once the most serious complaint has been diagnosed and treatment begun, HyperCard will issue a beep whenever it is necessary to repeat administration of medication. Although the frequency of the beeps will be based on generally-accepted recommendations for dosage and repetitions, the actual administration will depend entirely upon the condition of the individual patient. The program will be not a diagnostic tool, but an interactive record-keeping device.

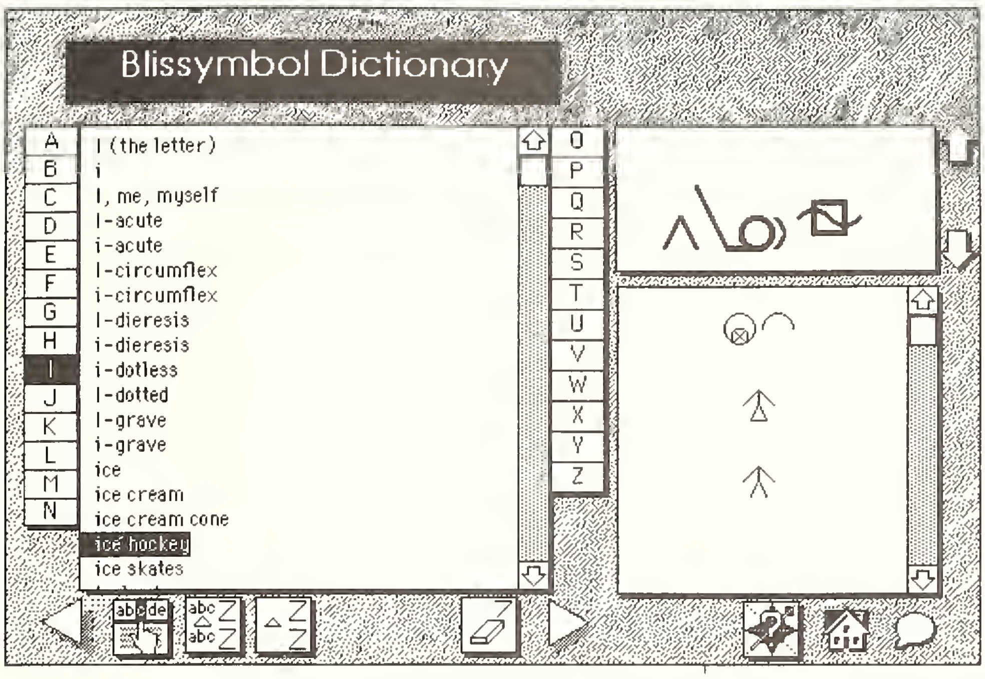


Sample card showing labelled parts of the right ear, plus palette with brush and pencil tools available for marking injuries.

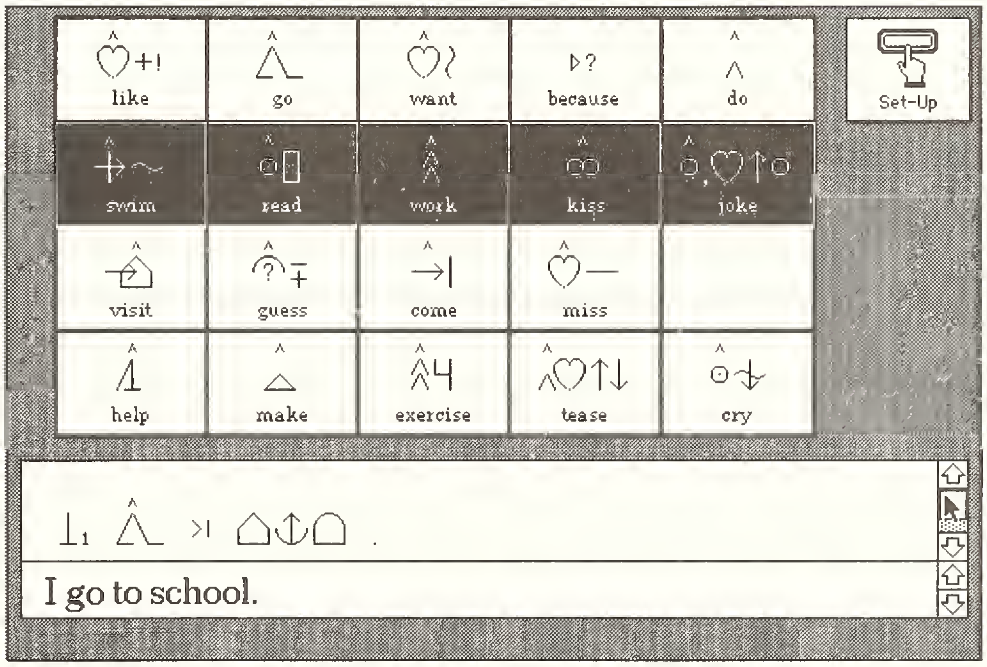
The benefits of a system such as this are manifold: treatment will be faster and more efficient; patient records will be more accurate and far easier to read than handwritten notes. One of the questions remaining, however, is at what point to commence with traditional monitoring.

Fraser Shein is working on his PhD in Human Factors, specializing in user interfaces for people with disabilities. He co-ordinates a research and development team in Microcomputer Applications at the Hugh MacMillan Medical Centre. Fraser is working in conjunction with Dr. Peter Reich of the Department of Linguistics, who has developed a Macintosh font in Blissymbols. Blissymbolics is a communication system composed of symbols, which makes it possible for non-speaking persons to communicate. From Dr. Reich's original dictionary in Microsoft Word, Fraser has taken this font and created a dictionary in HyperCard. The file is divided into alphabetic pages; further, it has an interface to access and see the symbols, and a special clipboard that allows the user to randomly select and copy symbols that can be pasted later into some applications.

In addition to the dictionary, Dr. Reich and Fraser have developed a communications program in HyperCard. This program has built-in grammatical rules, which automatically translate the symbols into correctly-spoken English. On each card, the Blissymbols are arranged into groups. As the cursor automatically moves across the screen in a preset pattern, the user issues the equivalent of a mouse click when the cursor rests over the symbol or symbol group of choice. Sentence construction is the result of the repeated process of selection through cursor movement and mouse clicking. Mouse clicks can be issued in the traditional manner, i.e. via a mouse, or with adapted devices designed to take advantage of the abilities of the user. This particular program was created specifically for one person; in order to issue mouse commands, he pressed his cheek against a device mounted near his head. Fraser's ARPP work has been to support Professor Reich by providing design guidance and expertise in terms of access by disabled users, and by supplying programming guidance.



This figure illustrates a card from the Bliss dictionary in HyperCard. The selected word, "ice hockey," is displayed in Bliss in the upper right hand window. The window below is the special clipboard, with several characters saved in it. The first is the Blissymbol for "computer."



I go to school.

A card from the special communications program, illustrating one row of characters being selected. At the bottom is the Bliss version of a sentence, and its grammatically-correct English rendition.

Paul Forage is completing his PhD in East Asian Studies, specifically the history of science and technology in China. While at the University of Victoria, he created a multimedia teaching program for third and fourth year biology classes. Information normally transmitted via textbooks or slides was conveyed by a computer. The program was created with HyperCard and videodisc technology, and was made available in a laboratory setting. Paul also developed a HyperCard stack to give lessons in Chinese, and another stack to teach intensive Japanese. Unlike the Kanji stack developed by former ARPP partner, **Nikki Yokokura** (see *ComputerNews*, April and October 1988), Paul's Japanese stack focused on grammar, specifically verb conjugation, rather than character recognition. Paul's project with ARPP will, ideally, involve the development of multimedia courseware, and subsequent workshops to demonstrate to users how to build their own multimedia courseware.

Eddy Wong is a pharmacology student with interests in chemistry and speech pathology. One project he is currently pursuing with the ARPP group is to make it possible to play back pictures (frames) at the speed of 30 frames per second on the Mac. This involves connecting U of T's Cray computer with the Mac, and the Mac with a digital signal processor (DSP). The Macintosh is a good "front end" for scientific visualization. It is popular and user-friendly, and it is less expensive than other colour, high-end workstations. Screen images, however, take up a lot of memory. A picture composed of 640 x 480 dots, with each dot capable of being any of 16 million colours (i.e., 24 bit colour), takes up 900 kilobytes. If you flash such pictures at the rate of 30 per second to produce motion, that's 27 megabytes per second.

This is where the Cray becomes useful. The Cray has the ability to run applications very quickly, so it is an ideal place to produce the frames. Information from the Cray is transferred to the Mac via Ethernet, a network which runs all over the U of T. Unlike other networks, which transmit information rather slowly (e.g., Appletalk, which moves information at the rate of 240 kilobits per second), Ethernet operates at a theoretical speed of 10 megabits per second. Practical throughputs are closer to 4 megabits per second. This is the same as .5 *megabytes* per second, and far short of the aforementioned 27 megabytes necessary to send 30 frames of video images per second. Thus, compression and decompression of the images becomes necessary. Within the Cray, each image is compressed to a size which allows it to run rapidly through the network. Once it reaches the Mac it is decompressed, and played back rapidly with the aid of the increased memory provided by the DSP.

Why, you may ask, should anyone go to all this trouble when it is possible to record a video on the Cray and play it back directly on the Mac? Simply put, the Mac is interactive. You can edit images and see the results immediately on the Mac; the Cray will remember your changes. You can't do that when you are merely playing back a videotape.

People on campus interested in learning more about this use of the Macintosh can call Eddy at 978-7828.

Dave Jackson, an MBA student with a background in engineering, has not determined the exact nature of his ARPP project. He is, however, looking forward to working with the researchers at the Faculty of Management Studies and the Faculty of Engineering.

Forging a link between Apple and the academic community is a mutually rewarding endeavour. Apple receives research assistance for a wide variety of projects – presumably this accelerates the process of software development. The universities receive comprehensive technical assistance and information, copies of beta software, and early notice of both demonstration software and new releases.

ARPP hours are from Monday to Friday, 10:00 am - 12:00 noon. Persons interested in viewing work that ARPP has done, or who need assistance with a specific project, are invited to call the University's ARPP Supervisor, Alex Nishri, at 978-7109.

Introducing JMP: Exploratory Data Analysis on the Mac

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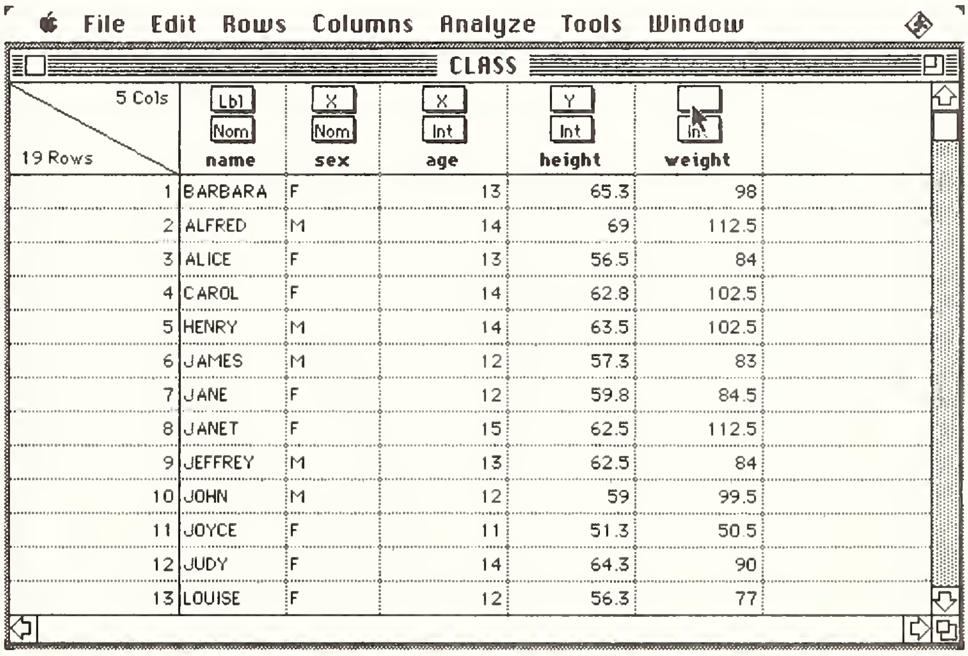
SAS Institute Inc. has introduced their first product for the Apple Macintosh: JMP, an interactive exploratory data analysis package. JMP (pronounced "jump") is primarily a statistical graphics tool with the ability to produce statistical analyses of your data. JMP, however, is not "SAS for the Mac." Its visual approach to data analysis is very different from SAS', and it has fewer analytical tools.

JMP takes full advantage of the Macintosh computing environment. After you enter data into spreadsheets (see example in *Table 1*), you can perform analyses quickly using the JMP main menu. You can select and easily manipulate the graphical displays of data and analytical results using standard Macintosh tools and techniques. JMP allows multiple spreadsheet and analysis windows to be open simultaneously during a session. The windows are linked, so that highlighting data points (outliers, for example) in a plot will cause the corresponding rows on the spreadsheet to be highlighted.

Users can create data tables in JMP by using its own spreadsheet or by importing data from a standard text file, a JMP export file, or a SAS transport file (Version 5 format). Each column in the data table represents one interval, ordinal, or nominal variable (assigned via a pop-up menu at the top of the column). New columns or new variables can be typed in or created using JMP's calculator. The calculator helps you to create values for the new variable by building a



	name	sex	age	height	weight
1	BARBARA	F	13	65.3	98
2	ALFRED	M	14	69	112.5
3	ALICE	F	13	56.5	84
4	CAROL	F	14	62.8	102.5
5	HENRY	M	14	63.5	102.5
6	JAMES	M	12	57.3	83
7	JANE	F	12	59.8	84.5
8	JANET	F	15	62.5	112.5
9	JEFFREY	M	13	62.5	84
10	JOHN	M	12	59	99.5
11	JOYCE	F	11	51.3	50.5
12	JUDY	F	14	64.3	90
13	LOUISE	F	12	56.3	77

Table 1: JMP spreadsheet

formula which depends on the values in other columns of the spreadsheet. New rows or observations can be typed in or added by concatenating another data table. A subset of rows can be analyzed or plotted by excluding or hiding unwanted rows. Mastering the spreadsheet and its accompanying calculator is probably the most difficult task when learning how to use JMP.

Once you have entered your data, you have to assign a **role** to each column by using the pop-up menu at the top of each column or by using the **Assign Roles** command in the **Columns** menu. The most common roles are X, when the column represents an explanatory or independent variable, and Y, when the column represents a response or dependent variable. Columns may contain labels for plotting, and frequency or weight values. You can also create a column that contains **markers**, special plotting symbols that appear in a graph. Thus, your graph can have triangular plotting symbols, for instance, instead of dots.

There are six analysis platforms which are available through the Analysis menu. JMP produces a standard analysis of the data; this analysis depends on the type of data (interval, ordinal, and nominal) and the role assignment (X or Y, etc.). Each platform can produce graphical displays of the results of the analysis, and summary reports, which users can display optionally. Some platforms will allow you to save analytical results (residuals and predicted values, for example) on the spreadsheet. A brief description of the six platforms follows, along with some examples of the statistical graphics produced by JMP.

Distribution of Y's

This platform allows you to produce descriptive statistics for any column of data. For interval data, you can produce histograms, box plots, and normal quantile plots. For ordinal and nominal data, you can create histograms and mosaic bar charts.

Text reports include data summaries such as moments and quantiles for interval data, and data profiles for ordinal and nominal data. Text reports will also give results of one-group and paired t-tests for interval data. *Figure 1* illustrates the histogram (with normal curve superimposed) and box plot for interval data. You can manipulate histograms interactively by "grabbing the plot" and changing the bin sizes.

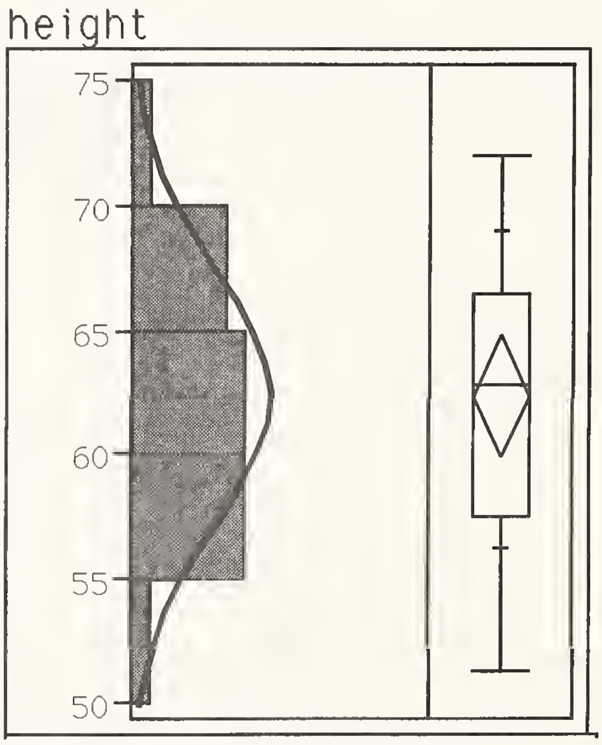


Figure 1

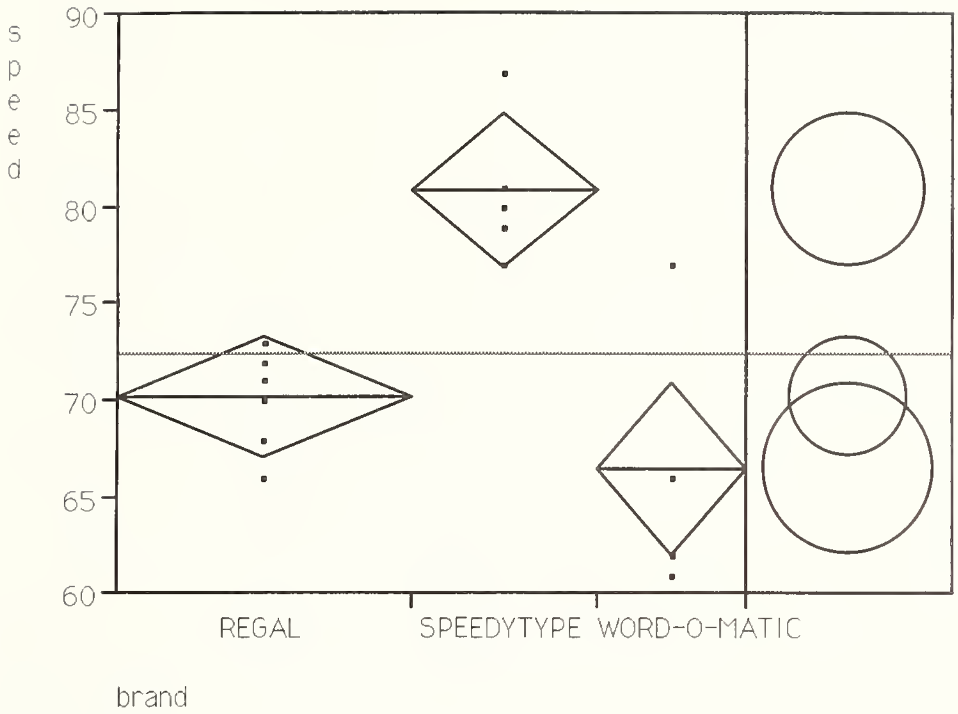


Figure 2

Fit Y by X

This platform is used for two-group t-tests, one-way analysis of variance, simple regression, polynomial regression, two-way cross-tabulation, chi-square tests, and logistic regression. Each type of analysis has its own graphical presentation of the analytical results. *Figure 2* illustrates the results of a one-way analysis of variance of typing speeds for different brands of typewriters. Means diamonds give confidence intervals for the means, whereas confidence circles help to illustrate statistical significance.

Fit Y by X's

This platform is used for multiple regression, two-way analysis of variance (without interaction), and analysis of covariance. *Figure 3* illustrates a leverage plot, which is produced as part of a regression analysis.

Specify Model

This platform is similar to Fit Y by X's, but allows you to tailor the model to fit your data. For example, you may wish to add an interaction term to the two-way analysis of variance model.

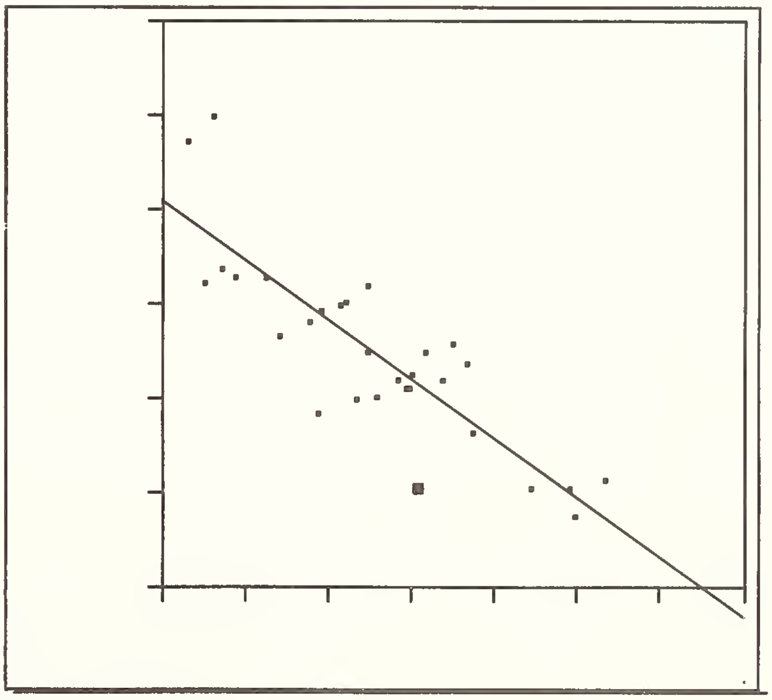


Figure 3

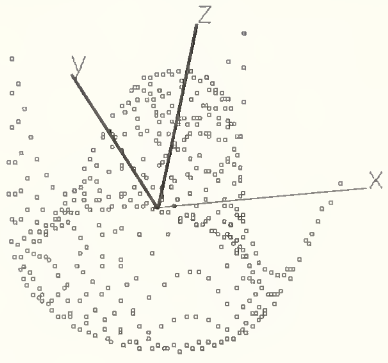


Figure 4

Spin

If you wish to produce three dimensional plots, this is the platform to use. You can manipulate plots interactively by spinning or rotating. “Spin” will compute the principal components for your data set. *Figure 4* is an example of a three dimensional plot.

Y’s by Y’s

This platform produces correlation matrices. The graphical version (see *Figure 5*) may be explored to identify outliers.

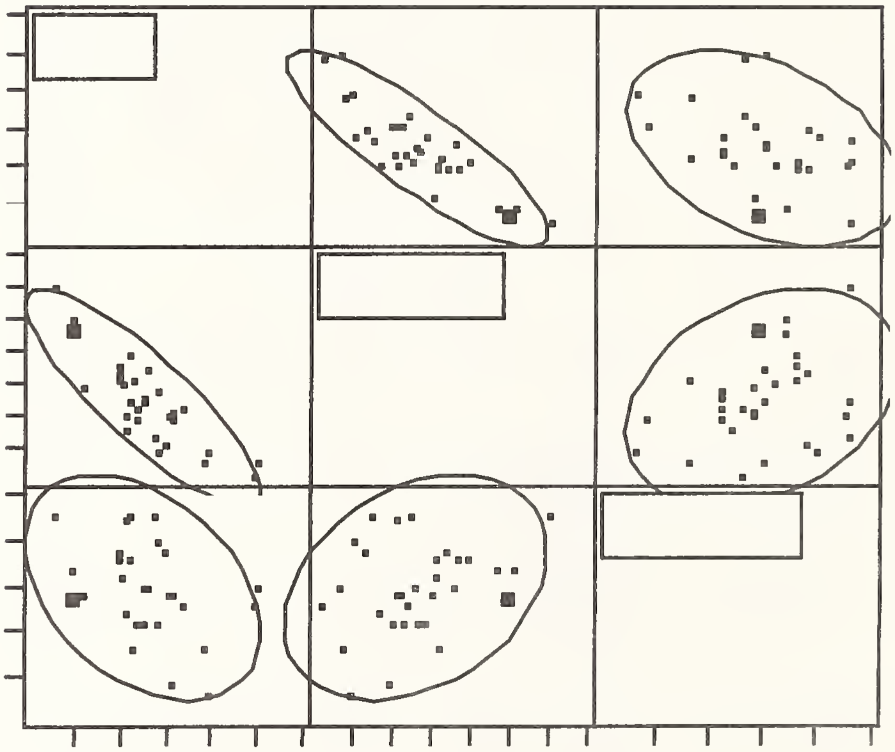


Figure 5

Personally, I like JMP. It is a good tool for exploratory data analysis. It is easy to use and it allows you to visualize and analyze the data quickly. However, since JMP chooses the type of analysis to be performed based on how the data are described in the spreadsheet, you have to be careful when interpreting the analytical results. There are sections of the manual that give statistical details of the analysis, but these sections are not very extensive. You really ought to be familiar with the underlying statistical techniques to make the best use of JMP.

The visual summaries of the analysis definitely help to convey the results of the statistical analysis to both statisticians and non-statisticians. If you have a colour monitor, the visual presentations are even more impressive. JMP would make a good tool for teaching statistics.

Because of the interactive nature of this software, you cannot record the commands used in any given session, which makes it difficult to reproduce your results. But various data summaries, i.e. spreadsheets, plots, and analytical results, can be copied into a journal file for future reference. The journal files can be stored in MacWrite format or text format. The standard cut, paste, and print options of Macintosh software are also available.

JMP is a statistical product which can stand alone, but it is also a good "front end" package for SAS, for example. Unfortunately, SAS and JMP function in different computing environments, making data transfer awkward for some people.

UTCS currently has a beta version of JMP. A production version is now available from SAS Institute, as well as a student version called ***JMP-IN***. The student version is limited to 500 cells for operations such as 'Save'.

If you have any questions about JMP or wish to see a demonstration of this product, call Sandra Gardner at 978-5128.

Pricing:

JMP - full version:

1 - 5 copies	$840 per copy
6 - 10 copies	$750 per copy
11+ copies	$725 per copy

JMP-IN:
$99 per copy

Academic discounts are available. To find out whether you are eligible, contact

SAS Institute (Canada) Inc
225 Duncan Mills Road, Suite 300
North York, Ontario
M3B 3K9
(416) 443-9811

SAS/FSP – What's in it for Me?

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SAS is a statistical analysis package. Most people use it to perform a specific type of statistical analysis on their data. For fairly simple analyses, base SAS may be enough. For more complicated analyses, the SAS/STAT (Statistics) module may be required, or SAS/ETS (Econometric Time Series) to analyze time-dependent data. If manipulation of matrices is desired, SAS/IML (Interactive Matrix Language) may be used. One other module, SAS/FSP (Full Screen Product), seems to be "under-appreciated" by many users, even though several aspects of it are very useful.

I shall discuss:

- SAS/FSP as a window to your data
- SAS/FSP as a database product
- SAS/FSP as an office help

The SAS/FSP manual describes the product in great detail, so I do not intend to do it here. My aim is to bring your attention to many of its useful features.

A Window to Your Data

As every SAS practitioner knows, data to be analyzed by SAS must be in a special form, known as a SAS data set. (Transforming data into this form is usually done through a DATA step.) This form is specific to SAS. If you want to examine information, modify observations, or add or delete observations, you must use SAS. Alternatively, you may want to create a new SAS data set with information to be analyzed. Without SAS/FSP, you would use PROC PRINT to examine the data and a DATA step to introduce changes to the data set (an inconvenient process). Additionally, many people find the DATA step unfriendly. Consequently, they often use different, friendlier packages for data input and then are faced with the problem of transforming their data into a SAS data set. SAS/FSP is an excellent choice for entering your data more easily.

FSP allows you to access your data directly on the screen. Assume you have a data set PATIENTS, which contains the following variables: NAME, ADDRESS, SEX, AGE, BP (blood pressure), ILLNESS1, ILLNESS2, ILLNESS3, MEDICAT1 (medication prescribed), MEDICAT2, MEDICAT3, LASTVIS (date of last visit). To examine this data using SAS/FSP you would issue the following command from the Program Editor window (data set is in a library LIB1):

```
PROC FSBROWSE DATA=LIB1.PATIENTS; RUN;
```

Immediately, you will be presented with a screen showing you the first observation of the data set (see *Figure 1*). You can now examine observation by observation, move directly to a given observation, or search for an observation for which a specified variable has a given value. In fact, searching through a data set can be done in a variety of ways (for details see the FSP manual).

This is a much more convenient way of examining your data than using PROC PRINT, but it is only small fraction of what SAS/FSP can offer. The same type of full-screen access is available for you to modify your data or to create a SAS data set directly.

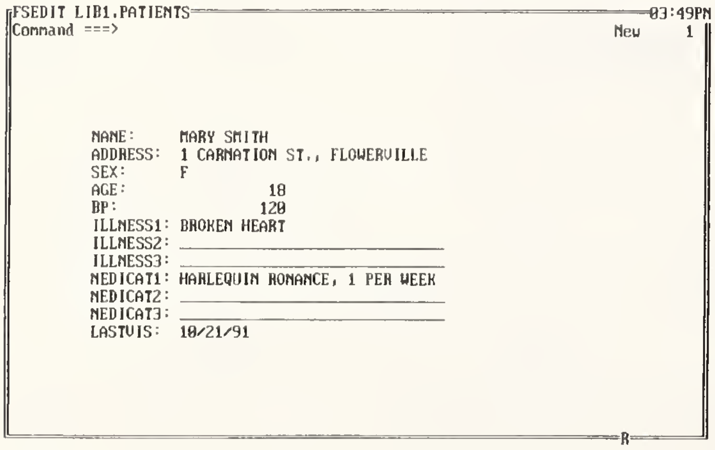
Assume that you want to enter your patient data into a SAS data set. With SAS/FSP you issue the following command:

```
PROC FSEDIT NEW=LIB1.PATIENTS; RUN;
```

NEW= instructs FSEDIT to create a new data set. You will be presented with a variable definition screen where you specify variable names, type (character or numeric), labels, and so on. After you have done this, you will be presented with the screen shown in *Figure 2*. Moving from observation to observation, you can now enter information into the designated fields. When you exit FSEDIT, (type END on the command line) the SAS data set LIB1.PATIENTS will be created. To add or modify observations to this data set another time, simply type:

```
PROC FSEDIT DATA=LIB1.PATIENTS;RUN;
```

Now you can proceed as in FSBROWSE with the option of modifying, adding or deleting observations.

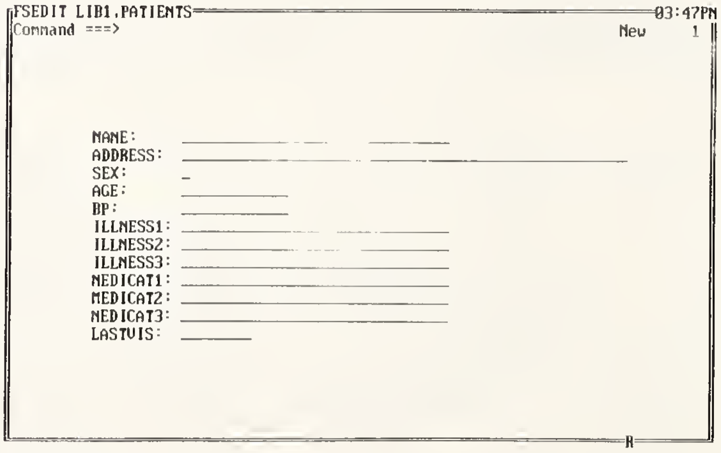


```
FSEDIT LIB1.PATIENTS                                                    03:49PM
Command ===>                                                       New        1



         NAME:       MARY SMITH
         ADDRESS:    1 CARNATION ST., FLOWERVILLE
         SEX:        F
         AGE:                  18
         BP:                  120
         ILLNESS1:   BROKEN HEART
         ILLNESS2:   ______________________________
         ILLNESS3:   ______________________________
         MEDICAT1:   HARLEQUIN ROMANCE, 1 PER WEEK
         MEDICAT2:   ______________________________
         MEDICAT3:   ______________________________
         LASTVIS:    10/21/91
```

Figure 1

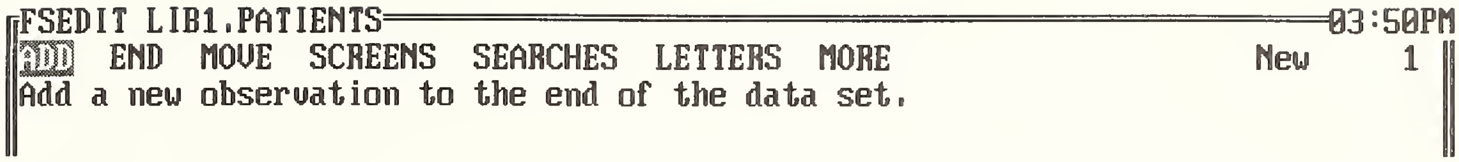


```
FSEDIT LIB1.PATIENTS                                                    03:47PM
Command ===>                                                       New        1



         NAME:       ______________________________
         ADDRESS:    __________________________________________________
         SEX:        _
         AGE:        ____________
         BP:         ____________
         ILLNESS1:   ______________________________
         ILLNESS2:   ______________________________
         ILLNESS3:   ______________________________
         MEDICAT1:   ______________________________
         MEDICAT2:   ______________________________
         MEDICAT3:   ______________________________
         LASTVIS:    ________
```

Figure 2



```
FSEDIT LIB1.PATIENTS=========================================================03:50PM
ADD  END  MOVE  SCREENS  SEARCHES  LETTERS  MORE                         New     1
Add a new observation to the end of the data set.
```

Figure 3

Though you issue commands to FSP by typing them on the command line, the product can also run in a menu mode. To display a menu of commands on the screen, type CMENU on the command line. The top part of your screen will now look like *Figure 3*. The first line displays available commands; the second displays a brief explanation of the highlighted command. Commands are selected using the TAB key. Pressing the ENTER key either executes the command or gives you a selection of subcommands from which to choose. Some commands may require additional information to execute; in this case, a small window will appear on the screen with fields to be filled. The SUBMIT key (usually F10) will then execute the command.

If you are not satisfied with the appearance of the data entry screen (*Figure 2*), you can design your own (see *Figure 4*). Not only can you arrange the variables on the screen and add your own explanatory text, but you can also define certain attributes for variable fields, e.g., specifying minimum and maximum values of a variable. This may help catch some of the errors which often occur during data entry.

If you have a colour monitor, you can display different fields in different colours, e.g., comments in blue and data fields (and values) in yellow. You can also display text in reverse video, highlighted, or blinking.

With a customized screen you must invoke FSEDIT in the following way:

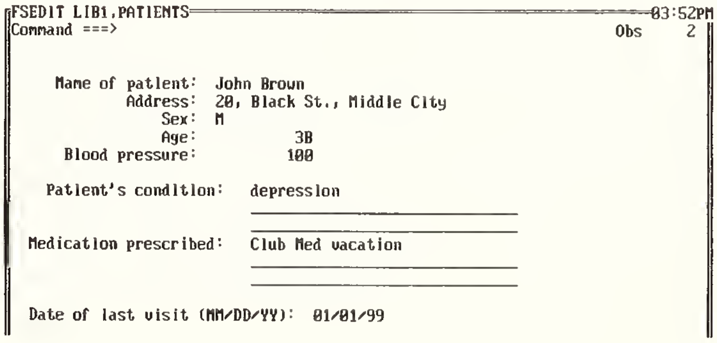
```
PROC FSEDIT NEW=LIB1.PATIENTS
SCREEN=LIB1.PATIENTS;RUN;
```

SCREEN= names a data set of type CATALOG, where the variable display is stored. (You choose the name of this data set.) The DOS file name for the example above will be PATIENTS.SCT, in the subdirectory pointed to by LIBNAME LIB1. Any time you access the data set PATIENTS using FSEDIT or FSBROWSE you should also specify SCREEN=LIB1.PATIENTS to have the variables displayed as customized. If you do not specify SCREEN=, a default screen is used (see *Figure 2*).

There is a third procedure which may be used to examine and modify data in a SAS data set. PROC FSPRINT displays your data the same way as PROC PRINT, but gives you interactive access to it. Another interesting feature of PROC FSPRINT is that you can access several data sets at the same time. It is also possible to move data from the data set you are examining to any SAS text editor window. Again, details can be found in the FSP manual.

A Database Product

The ability to locate observations with specified values for certain variables or, in the case of character variables, to search for specified strings embedded in selected variables make FSP a database tool. Previously, I have mentioned only very simple search and locate utilities. The flexibility of FSP in SAS Version 6 (available on microcomputers and UNIX workstations) is considerably enhanced by Screen Control Language (SCL). With SCL, you can set up sophisticated search and locate patterns, access several data sets simultaneously, and compare the information they contain. You can also move information around, and create subsets of data based on chosen criteria. All this is done interactively, with relevant information shown in a customized display.



```
FSEDIT LIB1.PATIENTS================================================03:52PM
Command ===>                                                        Obs     2


    Name of patient:  John Brown
            Address:  20, Black St., Middle City
                Sex:  M
                Age:           38
     Blood pressure:          100

   Patient's condition:   depression
                          ______________________________
                          ______________________________
 Medication prescribed:   Club Med vacation
                          ______________________________
                          ______________________________

 Date of last visit (MM/DD/YY):  01/01/99
```

Figure 4

At UTCS, we keep information about SAS/PC licensees in a SAS data set and use SAS/FSP to extract whatever specific information we may require at any given time. For instance, if we were notified by the SAS Institute that a problem was discovered in running SAS on Compaq computers, it would be very easy to locate all Compaq-based users and warn them.

Note: The manual describes this in great detail, but it may take some effort to master the intricacies of SCL. The rewards are substantial, though.

An Office Help

FSP can also act as an office aid. To continue the above example, we may want to send a letter detailing the problem to all SAS users with Compaq machines. This type of task is greatly facilitated by PROC FSLETTER. We would prepare a general form letter, then customize it for every destination by inserting pertinent details extracted from a SAS data set. PROC FSLETTER is instructed to insert into the letters the names, titles, and addresses of those people who have Compaq machines. SAS can also produce address labels (PROC FORMS), again taking the information from a SAS data set. At UTCS, we keep the list of *ComputerNews* subscribers in a SAS data set and use it to prepare the address labels before mailing out each issue.

In conclusion, SAS/FSP has a lot to offer for every SAS user, and enough interesting features to encourage even those who do not do statistical analysis to take a look at it.

Spreadsheets for Science and Engineering

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Spreadsheet programs are among the most popular software for microcomputers. Lotus 1-2-3 often hovers close to the top of the best-seller list, with Excel not far behind. These programs were designed specifically for business applications, especially accounting, but have developed to such a degree that they can be used profitably for solving many problems in science and engineering.

The capabilities of a spreadsheet program are most suitably applied to problems which are too cumbersome for a calculator, but not complex enough to warrant writing a full-fledged program in, for example, FORTRAN. Spreadsheets have a number of pre-programmed features, such as matrix multiplication and inversion, which enable users to eliminate many of the preliminaries required by programming languages. They come with integrated graphics, so the immediate visual display of results is as easy as pressing few keys.

Due to the high volume of sales, spreadsheets are fairly inexpensive. Likewise, they are so widely used that it is very easy to find a micro-computer in which one has been installed. For someone who only occasionally needs to make a modest calculation, using a spread-sheet installed on a colleague's computer can be an alternative preferable to using a calculator or writing a program.

Many people have recognized the features of spreadsheets which render them suitable for scientific and engineering purposes and have published books on the subject, including ***1-2-3 for Scientists and Engineers,*** by W.J. Orvis, Sybex, 1987, and ***Scientific Graphics with Lotus 1-2-3,*** by O.D. Jefimienko, Electret Scientific, 1987. The journal, *Computers in Physics,* regularly publishes articles about using spreadsheets for teaching physics.

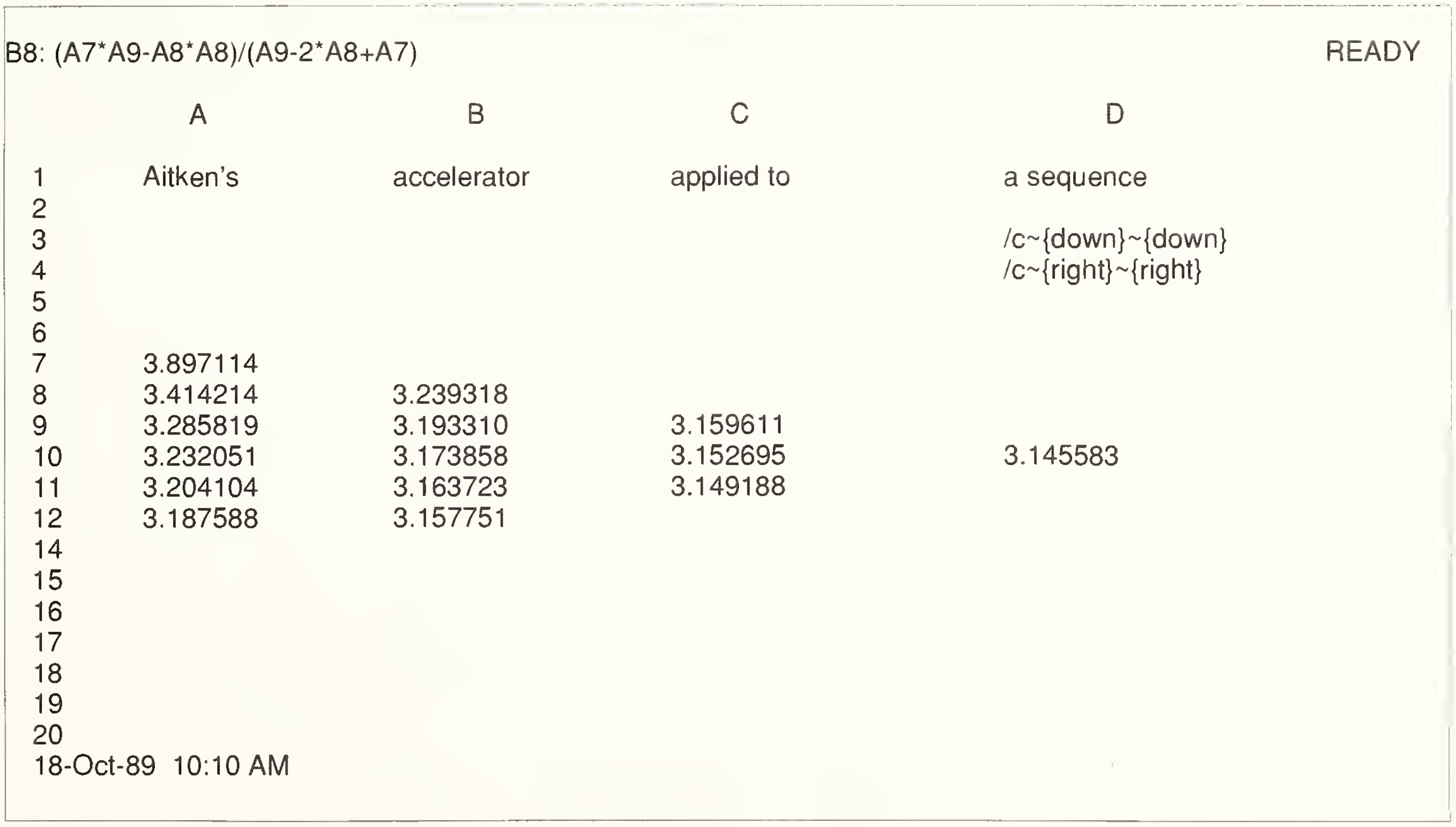
Obviously, one has to learn to use a spreadsheet program first. But since spreadsheets have been designed for such a broad spectrum of users with varying degrees of computer literacy, they are easier to master than many other computer programs. An excellent example of using a spreadsheet (Lotus 1-2-3, in this case) to model a classical population dynamics problem – the prey-predator equation – is given in an article by C.L. Enloe in *Computers in Physics*, Jan/Feb 1989.

As a further example, the following is an explanation of how to use Lotus 1-2-3 to speed up a convergence of a sequence with the iterative use of Aitken's accelerator (see M. Abramowitz and J.A. Stegun, ***Handbook of Mathematical Functions,*** NBS 55, 1964, p.18). The problem is this: one has a sequence of numbers which one expects to be a part of a sequence converging to a certain limit (in the example below numbers are successive approximations to π, obtained by averaging boundary length of successive polygons inscribed in a circle and circumscribed around the circle). However, the convergence is slow and an approximation to the limit presented by the last known term is unsatisfactory. It has been discovered that in many cases the following transformation of a sequence creates another sequence more quickly convergent to the same limit:

$$y_i = \frac{x_i x_{i+2} - x_i^2}{x_{i+2} - 2x_{i+1} + x_i}$$

where x_i is an element of the original sequence, and y_i is an element of the new sequence.

Figure 1



```
B8: (A7*A9-A8*A8)/(A9-2*A8+A7)                                        READY

            A              B              C                D

 1      Aitken's       accelerator    applied to       a sequence
 2
 3                                                     /c~{down}~{down}
 4                                                     /c~{right}~{right}
 5
 6
 7      3.897114
 8      3.414214       3.239318
 9      3.285819       3.193310       3.159611
10      3.232051       3.173858       3.152695         3.145583
11      3.204104       3.163723       3.149188
12      3.187588       3.157751
14
15
16
17
18
19
20
18-Oct-89  10:10 AM
```

First, you import the data from an ASCII file using the "/File Import Numbers" command, and then move it down a little with "/Move A1..A7 ~ A7" (~ denotes RETURN). You can also enter your figures into the spreadsheet directly. It is helpful to change the default format of two decimal places to six decimal places with "/Worksheet Global Format Fixed 6". Now in cell B8, write the formula (see *Figure 1*) with cell addresses A7, A8, and A9 for the first three elements of the sequence. This formula can be seen at the top of the screen. Pressing RETURN will cause Lotus to calculate and show the corresponding value, but the formula is still there, so copying it into cell B9 will give the next term of the new sequence, since the cell addresses, being relative, are correspondingly changed. As a result, cells A8, A9 and A10 are now used in the formula. The copying command "/c ~ {down} ~" ({down} means press the Down Arrow once) can be repeated after moving to cell B9; it will produce the successive value in the cell B10. This creates the new sequence contained in cells B8 to B12. Aitken's transformation (often called δ^2-process) can now be applied to the new sequence simply by moving the cursor to the cell B9 and executing "/c ~ {right} ~". Now in cell C9 there is a term obtained from terms B8, B9, and B10. Continuing the procedure finally produces a value in cell D10; this value is closer to π than the last term of the original sequence.

The whole process can be simplified considerably by using macros. The macro for copying a cell to the one below is noted in cell D3. This macro has been given the name \I; after placing the cursor in cell B8 and repeatedly using Alt-I, the sequence in cells B8 to B12 will be created. The macro for copying a cell to the one immediately to the right is shown in the cell D4. It has been given the name \J, so placing the cursor in the cell B9 and pressing Alt-J will create the contents of cell C9. Using Alt-I twice will fill cells C10 and C11; again with the cursor in cell C10, pressing Alt-J will produce the value seen in cell D10.

Although the preceding example is a trivial one, using a pocket calculator to do these calculations would be a cumbersome task, fraught with the potential for error. Users interested in studying more sophisticated examples can examine past issues of *Computers in Physics* or examine a diskette containing several examples discussed in this magazine. *Computers in Physics* is available at the Physics Library; arrangements to view the disk can be made by contacting Andrzej Pindor at 978-5045.

People with modest computing needs might be well served by the capabilities of popular spreadsheet programs. These programs, which are widely available and fairly inexpensive (some of them have Student Editions at bargain prices), can be used advantageously in cases where the investment in programs with serious computational capabilities is unwarranted.

To contact *Computers in Physics*, write to
American Institute of Physics
500 Sunnyside Blvd.
Woodbury, NY 11797
U.S.A.

SAS News

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UTCS now has the production version of SAS/ETS (Econometrics and Time Series procedures) available for SAS/PC users. You can purchase an annual license for SAS/ETS for $35. Call Shirley MacLeod at 978-4990 to purchase your license and arrange to borrow the diskettes.

UTCS has received an updated version of the *SAS Usage Notes* (effective September 1989). These notes document problems with the current SAS release, provide tips on using the software, and give information about zaps to the systems. SAS Institute has also distributed a problem correction notice for the following procedures: CATMOD, CLUSTER, DISCRIM, ORTHOREG, PROBIT, and VARCOMP. For more information call Sandra Gardner at 978-5128 . If you wish to upgrade your version of the *SAS Usage Notes* call Shirley MacLeod at 978-4990 to arrange to borrow the diskettes. Also, take note that the *SAS Usage Notes* data set and the accompanying zaps require about 2 megabytes of storage.

SAS is also available for SUN/3 workstations of any size. Licenses for SAS/BASE, SAS/STAT, and SAS/GRAPH may be purchased at a rate of $150 per year. Likewise, licenses for SAS/FSP and SAS/IML are available for $50 each per annum. If you have any questions, call Barry Lay at 978-6509.

SPSS News

It is time to renew your license for SPSS/PC for the period from November 1989 to October 1990.· The renewal fee this year is $100. If you require a renewal form, call Shirley MacLeod at 978-4990 to have one sent to you.

Renewal Notes

At renewal time, if you wish to update or install a program and you have to borrow installation diskettes from UTCS, there are a few things you should keep in mind. UTCS has a limited number of copies of each program available, so please call ahead to reserve the diskettes you require. This way we can ensure that they are on hand when you come in with your renewal form. A twenty-five dollar deposit for each box of diskettes is required. Certain programs can require several boxes, so the amount of each deposit is different. Cash, cheques, money orders, and CAN numbers are acceptable forms of deposit. When you return the diskettes, UTCS refunds your money. Call Shirley MacLeod at 978-4990 if you would like more information.

Site License for NAg FORTRAN Library

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UTCS is investigating the viability of obtaining a site license for the NAg FORTRAN Library. NAg, the "Numerical Algorithms Group", is based in Oxford, England. The license would be directed primarily toward owners of UNIX workstations (SUN, Apollo, Silicon Graphics, etc.), but could be expanded to include other computers as well.

The basic site license available from NAg covers three implementations (i.e. types of computers) and an unlimited number of workstations at a cost of US$10,000 per year. Hence, if there were 20 sites interested in purchasing a site license, the individual cost would be $500. (An independent purchase of the library from NAg costs $945.) Each additional implementation (type of computer) adds $1500 to the cost of the basic license. (This additional cost would be shared by those requesting a license for computers not included in the main three implementations.) For installations involving a file server and a number of diskless workstations, the full price ($500) would be levied for the server and only a fraction of the full price for each diskless workstation authorized to use the Library. The prices cited depend entirely on the number of sites involved – a greater number of sites would result in a significantly lower cost.

Below is a table outlining the areas covered by the NAg FORTRAN Library.

NAg FORTRAN Library Mark 13

The NAg FORTRAN Library consists of about 700 routines organized in the following chapters:

A02	- Complex arithmetics	- 3 routines
C02	- Zeroes of polynomials	- 2 routines
C05	- Roots of one or more transcendental functions	- 11 routines
C06	- Summation of series	- 20 routines
D01	- Quadrature	- 25 routines
D02	- Ordinary differential equations	- 57 routines
D03	- Partial differential equations	- 10 routines
D04	- Numerical differentiation	- 1 routine
D05	- Integral equations	- 2 routines
E01	- Interpolation	- 7 routines
E02	- Curve and surface fitting	- 22 routines
E04	- Minimizing or maximizing a function	- 46 routines
F01	- Matrix operations, including inversion	- 63 routines
F02	- Eigenvalues and eigenvectors	- 34 routines
F03	- Determinants	- 9 routines
F04	- Simultaneous linear equations	- 33 routines
F05	- Orthogonalization	- 2 routines
F06	- Linear algebra support routines	- 97 routines
G01	- Simple calculations on statistical data	- 21 routines
G02	- Correlation and regression analysis	- 26 routines
G03	- Analysis of variance	- 4 routines
G05	- Random number generators	- 33 routines

NAg FORTRAN Library Mark 13 *cont'd*

G08	- Nonparametric statistics	- 11 routines
G11	- Contingency tables	- 2 routines
G13	- Time series analysis	- 27 routines
H	- Operations research	- 2 routines
M01	- Sorting	- 37 routines
P01	- Error trapping	- 2 routines
S	- Approximations of special functions	- 45 routines
X01	- Mathematical constants	- 2 routines
X02	- Machine constants	- 24 routines
X03	- Innerproducts	- 2 routines
X04	- Input/output utilities	- 4 routines

At the time of writing, only 12 sites have expressed an interest in securing a license. This is not enough to make site costs attractive to purchasers or to warrant an expenditure of $10,000. Those interested in acquiring the NAg FORTRAN Library should call Andrzej Pindor at 978-5045.

Site License for Dynamical Systems Software

UTCS has acquired a site license for a program called ***Chaos In The Classroom I: Maps and Bifurcations***, from Dynamical Systems Inc. This program was described in detail in the September 1989 issue of *ComputerNews*. To recover the cost of the license, UTCS is charging users $12 for a single installation; the manual is available for an additional $28.

Dynamical Systems Inc. is developing the next program in the same series, ***Chaos In The Classroom II: Fractals and Julia Sets***. If there is sufficient interest, UTCS may acquire a license for this as well.

For more information about the Dynamical Systems site license, call Andrzej Pindor at 978-5045.

Numerical and Scientific Software News

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MathCAD News

UTCS has recently received MathCAD 2.5, the current version. The main highlights of this version are:

- surface plots
- block cut-and-paste for multiple regions
- new device drivers, including PostScript
- ability to import drawings created by other software, e.g. CAD packages
- more accurate algorithms for numerical integration and trigonometric and inverse trigonometric functions

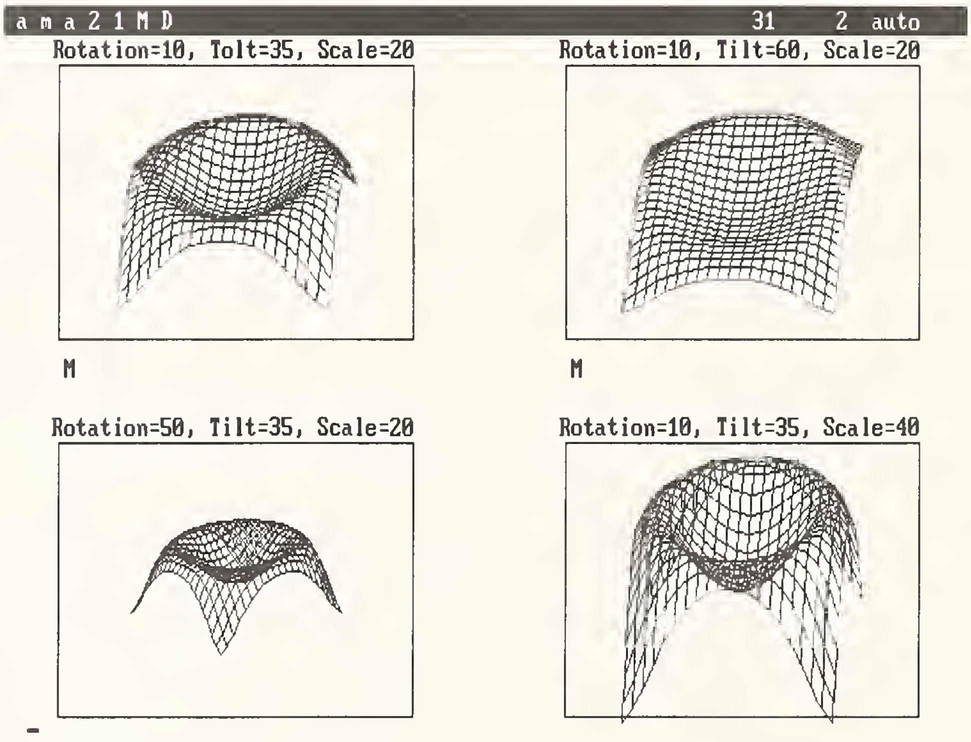

a m a 2 1 M D
31
2 auto
Rotation=10, Tolt=35, Scale=20
Rotation=10, Tilt=60, Scale=20
M
M
Rotation=50, Tilt=35, Scale=20
Rotation=10, Tilt=35, Scale=40

Figure 1

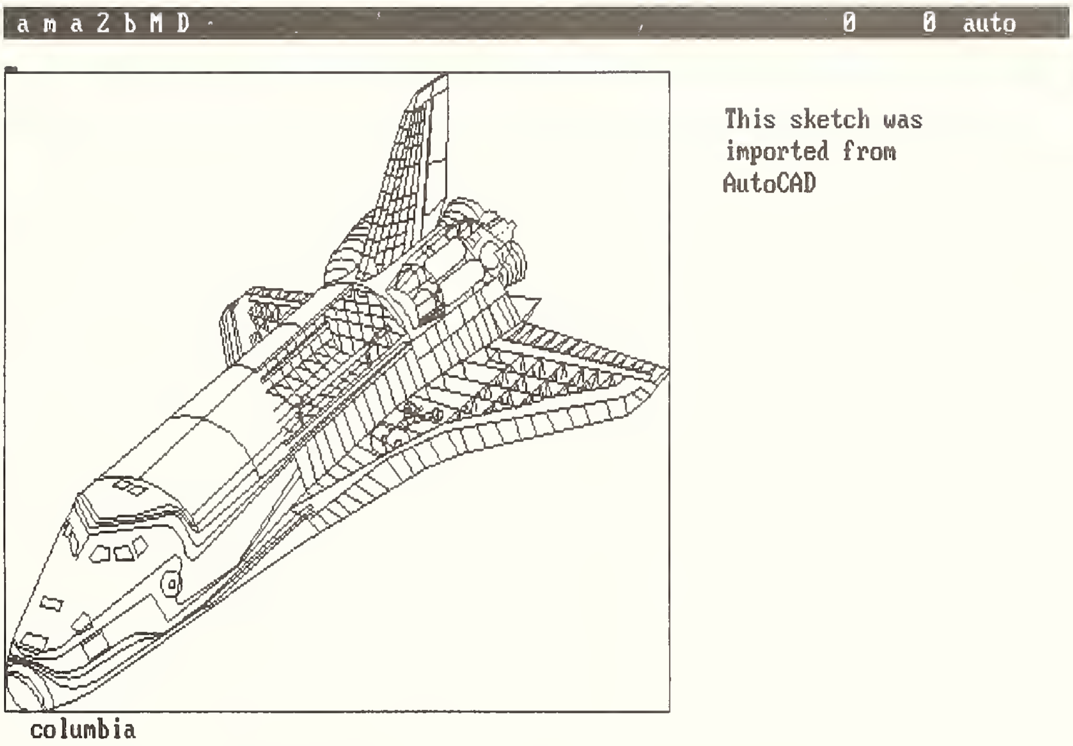
As reported previously (*Computer-News* #252, January/February 1989), in MathCAD 2.0 it was possible to draw a "fishnet plot" of a surface, using a program from the Advanced Math Application Pack. Drawing surfaces is now incorporated into MathCAD itself and, in fact, is made very easy. Using a pop-up menu, the surface can be rotated, tilted, and scaled, as shown in *Figure 1*. This example was printed using a MathCAD PostScript driver. *Figure 2* shows a sketch imported from AutoCAD.

The new integration algorithm allows you to calculate integrals for functions which are singular at one or both ends of the integration region (see *Figure 3*). Here, another new feature of version 2.5, a formatting menu, is also demonstrated in *Figure 3*. Similar menus are available for formatting two-dimensional plots, surface plots and sketches.

The new enhancements make MathCAD an even more enjoyable product.

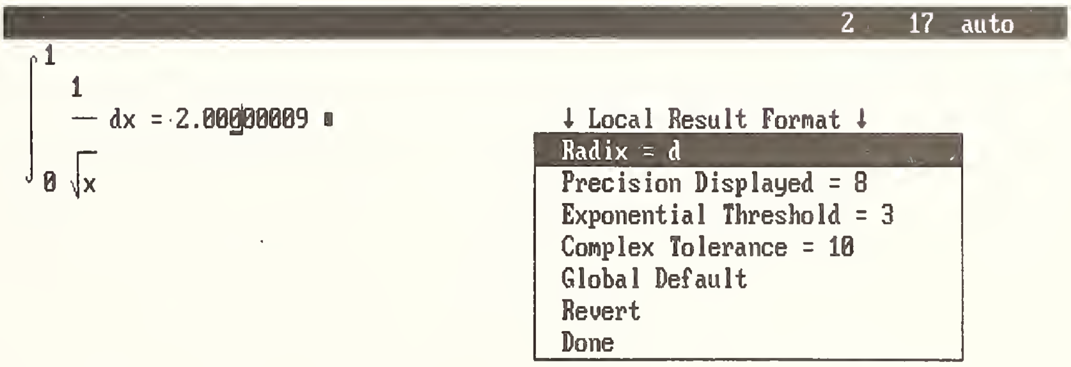
Now Available for Macintosh

MathCAD is now available for Macintosh computers as well as PCs. The Macintosh version is MathCAD 2.0 with the 3D plots of version 2.5. The cost is US$495.



This sketch was imported from AutoCAD

Figure 2



$$\int_0^1 \frac{1}{\sqrt{x}}\,dx = 2.00000009$$

↓ Local Result Format ↓

Radix = d
Precision Displayed = 8
Exponential Threshold = 3
Complex Tolerance = 10

Figure 3

Virtual Memory Version of GAUSS

Aptech Systems has developed a virtual memory version of GAUSS-386 (called GAUSS-VM) that uses your hard disk space for additional workspace. With GAUSS-VM it is possible to allocate workspaces larger than your available RAM. You specify the amount of workspace desired when you start the program and your hard disk is used as extra workspace, with the data swapped in and out as needed. To obtain GAUSS-VM, write to:

Aptech Systems, Inc.
26250 196th Place S.E.
Kent, Washington 98042
or call (206) 631-6679.

PC Magazine Evaluates Mathematical Toolboxes

The March 1989 issue of *PC Magazine* contains an extensive evaluation of mathematical toolboxes. The following packages are reviewed:

- Asystant
- Eureka
- Formula/One
- IAS
- MathCAD
- PointFive
- The Professional Wheel
- The Scientific Wheel
- SolveIT
- Tekcalc
- Asyst
- Curve
- GAUSS
- MathGraf
- Matlab
- TK!Solver Plus

The reviewers conclude that GAUSS and MathCAD are the top two packages.

IMSL FORTRAN Libraries Available for Macintosh Computers

IMSL has made available three of its FORTRAN libraries, MATH/LIBRARY, STAT/LIBRARY and SFUN/LIBRARY, for Macintosh II, Macintosh SE/30, and Macintosh SE 2/40 computers. The Libraries work with a Language Systems FORTRAN compiler. The following prices (US$) for object code, with educational discount, apply:

A. Complete Libraries Group

	one-time fee	**annual support renewal**
1 CPU*	$2,900	$600
2nd CPU	2,220	100
3rd - nth CPU, each	1,160	90

Purchases made before December 29, 1989 include a complimentrary FORTRAN compiler by Language Systems Corporation, valued at US$350.

*Until December 29, this item is being offered at a special introductory price of US$1,950.

B. Math/Library

	one-time fee	**annual support renewal**
1 CPU	$2,100	$400
2nd CPU	1,620	100
3rd - nth CPU, each	860	90

C. Site License (available for complete libraries group only)

maximum copies		
10	$ 7,500	$1,125
50	15,000	2,250

The IMSL Libraries can be obtained by contacting:
IMSL
2500 ParkWest Tower One
2500 CityWest Boulevard
Houston, Texas 77042-3020
(713) 782-6060

For further details concerning all or any of these products, contact Andrzej Pindor at 978-5045.

Seybold Conference 1989: A Report

John Bradley
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For the past several years, an autumn event in California has encapsulated the current status of publishing and personal computers. The Seybold Computer Publishing Conference (held in San Francisco in mid-September — before the earthquake) brought together the major players in the desktop publishing world: hardware vendors and users, and almost all desktop publishing (DTP) and related software vendors and users.

This year's conference and show spanned three very full days. The show attracted about 250 vendors, with products ranging from typesetters to scanners to high-speed personal computers — all aimed at the computer publishing market. At the conference, speakers ranged from the major players in the personal computer industry such as Bill Gates (president of Microsoft) to small individual users who were doing innovative things. Presidents, vice-presidents, and CEOs of Microsoft, Apple, IBM, Sun, NeXT, Linotype, and Adobe spoke about the major issues of desktop computing, and about personal computing in general. It was a big event.

The conference focused on several major issues, the three most important being fonts, colour, and hypermedia.

Whither Fonts?

Fonts generated the most excitement and provided the major news story of the conference. The source of the excitement was Microsoft's announcement (made publicly for the first time at the conference by Bill Gates) that Microsoft is adopting Apple's new font format (see below) for use in OS/2's Presentation Manager and, in turn, Apple is joining with Microsoft to develop PostScript-compatible printers based on PostScript-clone technology Microsoft purchased last Spring when they bought Bauer Enterprises.

For some readers of *ComputerNews* (particularly those not using a windowing presentation model such as the Macintosh or Windows for the PC), the prominence of this issue may come as a surprise. Well, fonts, and how your computer supports them, continue to grow in importance. This is because personal computers are used more and more to generate high-quality presentation material, from publications such as reports or newsletters, to hypermedia, to colour slides and overheads. In all these areas, the quality and variety of the fonts you can use is important.

As recently as a year ago, the major computer companies (even Apple!) didn't think that quality fonts on the screen were particularly important. Now they know that many of the more powerful personal computers are purchased, in significant part, to prepare high-quality presentations of various forms, and their users are demanding more flexibility and quality than ever before. For this reason, the major players are planning improvements to their systems to support them. At last year's Seybold conference, Apple was still telling attendees (publicly at least) that scalable fonts for the screen were unimportant. Subsequently, however, Apple apparently had a public change of heart, announcing at the March Seybold conference that they were working towards scalable screen display of fonts for System 7, and then announcing the new scalable font technology (code-named "Royal") in May for the Macintosh's System 7 (expected to be released next year). Microsoft, too, has decided to build high-quality font support into its Presentation Manager for OS/2 — although when this will be available is still unknown. The announcement that OS/2's Presentation Manager and the Macintosh will share the same basic font format is of major significance to the desktop publishing industry. These two major players (and many other companies) are pouring many person-years of time into the development of this technology. You can expect that this will result in new standards for personal computers that most people will be seeing and using in a few years. (For more information about Apple's Royal Font technology see the sidebar "Royal Fonts & Scaling".)

Colour

Another major theme of the Seybold Conference was colour printing for desktop computing. This has only recently become a serious topic for desktop publishing users because personal computers are now fast enough and have sufficient disk storage to be taken seriously as colour workstations for publishing purposes. The Seybold conference devoted many sessions to the issues of colour for the powerful personal computers now in existence. It was evident that business and commercial users of desktop publishing systems were very interested in desktop colour processing and the cost savings it might represent to them.

Desktop colour publishing is still in its infancy, however, for several reasons:

- High-quality colour image files (of colour photographs, say), are very large; your computer needs many megabytes of memory to load one. Your hard disk still needs at least one megabyte per picture to store them.
- The process of preparing colour for printing (colour separations, and other prepress processes) cannot yet be automated in such a way that most users could take advantage of them. Colour prepress preparation still uses highly-skilled (and highly-paid) people.
- Colour reproduction is still much more expensive than black and white printing — too expensive for many people who are using desktop publishing.

Because of the cost of colour reproduction alone, UTCS has concluded that the interest in colour printing at the University of Toronto will remain small, for the time being at least. We are not planning to get "into" desktop colour as it might be used in colour printing. We do expect, however, that university interest in desktop colour will grow in the area of presentations: colour slides or overheads. We are already gearing up to handle this area.

Hypermedia

The Seybold conference was attended by people associated with all areas of publishing. Many of these people were interested in hypermedia: using the computer to prepare, present, and coordinate text, sound, and images. Five of the conference sessions were dedicated to hypermedia issues, a surprisingly large proportion considering that most of the attendees were publishers or commercial users who had focused on traditional paper publishing in the past. Although these sessions were not as popular as the one about colour printing, they were well attended, and covered topics ranging from desktop animation to video and hypertext. Two of the presentations came directly from educational institutions and represented their interests.

Hypermedia is a natural topic for education. The mixture of high-quality images, sound, and text — plus the ability to allow the hypermedia user to tailor and pace the presentation to suit his/her needs — should make computers and hypermedia a topic of wide interest to universities. Publishers are beginning to look at the possibilities of this type of electronic publishing; universities in the U.S. are looking at how hypermedia might benefit them. While UTCS has been involved with hypermedia for some time, more people here at the University of Toronto might want to investigate the possibilities also.

Looking to Next Year

So what's going to happen at the Seybold conference next year? Well, the computer industry changes quickly and, sometimes, surprisingly. Last year, no one would have expected the font issue, or hypermedia, to be as important as they turned out to be. Based on past experience, one thing is sure: the Seybold conference continues to have an influence in setting the direction of personal computing. If you are interested in other things that happened at this year's event, give me a call at 978-3995.

Royal Fonts & Scaling

Apple has announced major changes in the way the Macintosh will handle fonts, starting with Version 7 of the Macintosh's operating system (expected in mid-1990). The change involves the introduction of an entirely new scalable font technology: the so-called "Royal" format (the name "Royal" is a code-word — Apple might call their format something else when they officially release it).

Up to now, Macintosh screen fonts were stored as grids of dots ("bit-mapped" images). To display a letter in the size exactly corresponding to the given grid of dots, the Macintosh system simply had to copy the grid in the font model to the actual grid of dots that make up the screen. Displaying letters of different sizes was done either by finding a grid selection that exactly corresponded to the size desired, or scaling the dots (see *Figure 1*). This is easy and fast for the computer to do — however, it tends to produce chunky-looking text when the size is large.

The new "Royal" format changes all this. Royal-format fonts are described as geometrical shapes made up of straight lines and curves. When you indicate that you want a particular style and size of type, the

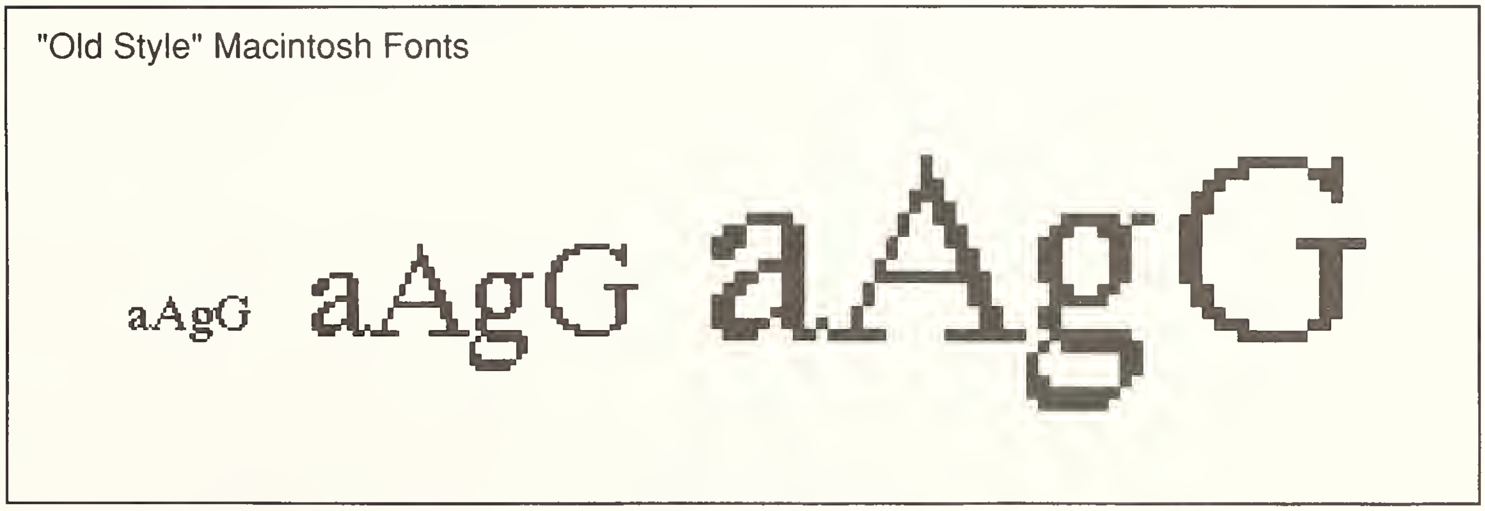
"Old Style" Macintosh Fonts

Figure 1

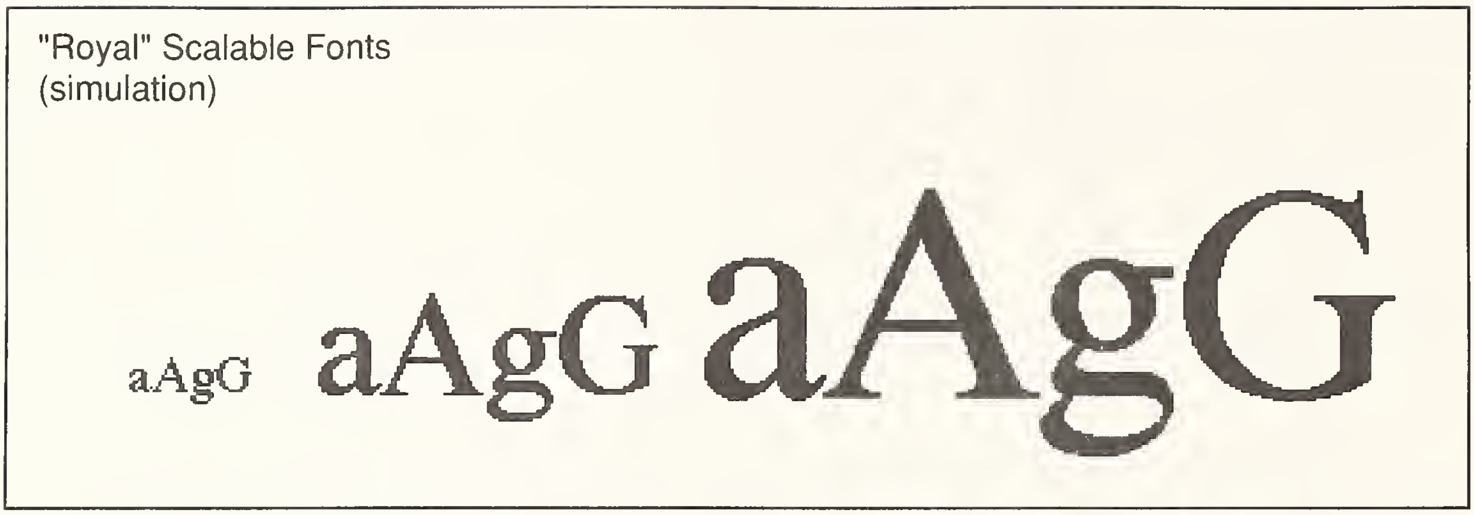

Figure 2

Macintosh will take the corresponding mathematical shape and (on the fly) convert it to a grid of dots for displaying on the screen—a process called "scaling." A simulation of how Royal-format scaling will affect what you see on the screen (showing the same font drawn with scalable font technology) is shown in *Figure 2*.

Scalable fonts have been slow to develop on personal computers because many problems inherent in the scaling process had to be solved before the fonts could be practical. *Figure 3* shows the problem most clearly. On the left is the letter "A" in the Times font, as available from PostScript printers. In the middle is a superimposed grid (representing the screen); each box in the grid represents a screen pixel. Each pixel must be either entirely black or entirely white. We have (in the middle of the picture) manually turned on the boxes more than 50% inside the letter outline. The greyed boxes represent the pixels on the screen we have chosen to turn "on" and make black. The resulting character rendition is shown on the right. As you can see, the character looks pretty rough.

There are a couple of things that should be clear from this exercise:

(1) The shape can be more easily traced when the letters are larger (because there are more dots to play with).

(2) Any simple approach to turning on dots will cause problems with small letters. All modern scaling technologies include the idea of "hints" which give the scaling software extra information to help it render small fonts more accurately.

Why were fonts not scalable in the Macintosh from the beginning? Well, the main reason is that it is only recently that the "standard" Macintosh has become sufficiently powerful for this to become practical. Converting a scalable font into grids of dots for display, on demand, takes more computing power. The usual strategy is to save the scaled grid in computer memory (RAM) as long as possible, so that it can be reused. For this to be effective, you need a significant amount of computer storage. Furthermore, the computing strategies to do this conversion quickly have been refined and accelerated over the past few years. Apple says that "standard" Macintoshes (i.e., 2MB MacPlus or up) will be able to scale the Royal fonts quickly enough that the user will not have to wait unduly.

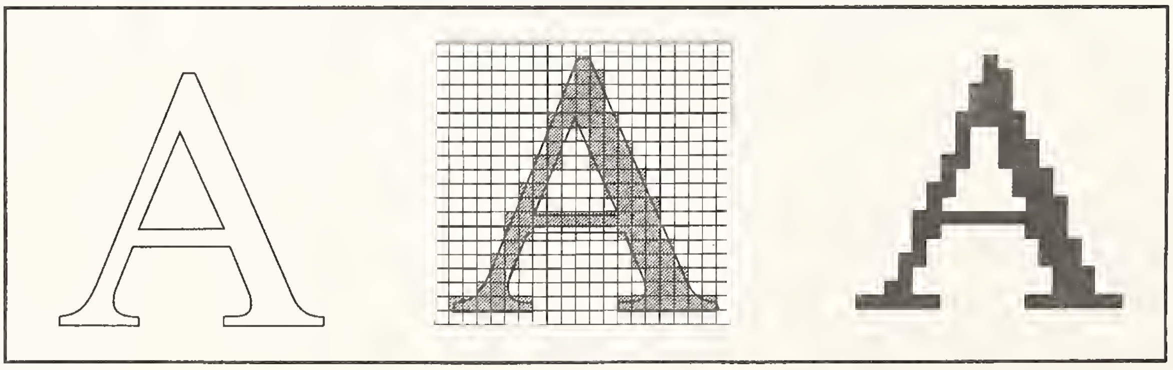

Figure 3

Educational Discounts for Microcomputer Software

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Five years ago, a significant amount of the computing at U of T was done on mainframe computers. Many people in our community could complete their studies or do their jobs without ever thinking about a computer, much less actually touching one. Today, microcomputers are found on desks everywhere, and computer equipment, software, or supplies have become standard items in many departmental and personal budgets.

The cost of all this is not trivial; thus, cost is the explanation usually given by people with "unauthorized" copies of software. They may not be aware that many software companies offer substantial educational discounts. These discounts come from the companies themselves, not the store where you buy the product. Sometimes discounts are negotiated by the educational institution. Occasionally they are set by the vendor, so that you will get the same price whether you order directly from the company or from a store, although a store could add its own discount to the educational discount.

The list of software packages with educational discounts includes many of the most popular products: WordPerfect, both on the PC and the Mac; Lotus 1-2-3; dBASE IV; MacWrite and MacPaint; Microsoft Word (IBM and Mac), Excel, Windows 286 and 386, and Microsoft Mouse/Paintbrush; Borland's Turbo C, Turbo Pascal, and Assembler Debugger; and Letraset's ImageStudio and Ready, Set, Go!. Discounts average forty percent below the best "street" prices. Of course, the percentage is much greater if you compare with the suggested retail prices.

You can take advantage of these discounts in a couple of ways. In some cases, you may order directly from the company or through a dealer, although off-campus dealers often direct you to a campus outlet (in our case, the Computer Shop). If the discount was negotiated by U of T (discounts for Apple products, for example), you must purchase through the University, usually through the Computer Shop. When purchasing, you will probably have to provide proof of eligibility. If you are not using a Purchase Order, you may be asked for University identification, such as your library card, or you may have to fill out a form.

Why should you bother to buy when you can get a free copy from your friend? In addition to that warm, fuzzy feeling you get inside for being an honest soul, you will receive advising and technical support for the package when you run into difficulties using it. You also will be able to purchase inexpensive upgrades if you change to a different machine with a newer operating system that doesn't support your friend's old version of the package, or when a new release contains features that you need but your friend doesn't.

This isn't meant to be a sermon. It *is* meant to help people who would like to have legal software but don't have much money for it, or who don't know about educational discounts.

Good News, WordPerfect Users, WordPerfect 5.1 is Now Available!

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Good news for WordPerfect users making their Christmas lists. WordPerfect 5.1 is now available! (For ordering information, see the end of this article.)

From the limited information we have heard about WordPerfect 5.1, it seems to be winning favorable remarks from its beta testers. Lisa Picarille, author of "WordPerfect 5.1: More Powerful, Easier to Use" in *PC Week* (Sept. 18, 1989), reports that the early users of WordPerfect 5.1 are giving high marks to several of its improvements and new features. Among them are facilities to create complex tables and equations, to import data from various spreadsheet programs (such as Lotus 1-2-3, Microsoft Excel, and WordPerfect's PlanPerfect), and to print any of WordPerfect's 1,700 characters. She also reports that people are excited about the improved mail-merge, tab-setting, help file, and dictionary-based hyphenation. The new version of WP will also have mouse support, pull-down menus, and the ability to use long filenames.

Although UTCS will have to wait for the arrival of the new version before providing a comprehensive evaluation, it is possible to share some of the new enhancements with you.

Tables

A new table feature will enable you to easily create organized rows and columns of tabular data enclosed in graphic lines. One table can contain as many as 32 columns and 765 rows, and math functions can be performed on the numeric data in the table. It is also capable of importing spreadsheets, both into tables and elsewhere in the program.

Equations

For those who need to print scientific and technical formulae and equations, there is a new feature called "Equation Editor." It comes equipped with a complete collection of symbols, characters, and mathematical operators, to enable you to enter complex equations and perform mathematical operations. As well, equations can be previewed, immediately, on the screen.

Pull-Down Menus and Mouse Support

If you love WordPerfect but long for the ease of using a mouse, then the new version is for you. WordPerfect 5.1 has mouse support and pull-down menus. The mouse can be used to select features and functions of the program, move the cursor, and block text. All functions can be taken in at a glance by pulling down menus with a single key, and you can proceed through the feature menus using cursor keys.

Expanded Fonts in Printing

With WordPerfect 5.1 and any WP Corporation-supported printer capable of graphics, you can print any of the more than 1700 characters in the WordPerfect character sets. Even if a certain character or symbol isn't built into the type of printer you are using, WordPerfect 5.1 will print the character as a graphic.

Improved Tabs

Tabs, in WordPerfect 5.1, can be set relative to the current left margin. This means that tab stops will adjust automatically whenever the left margin or columns and text boxes are changed. For example, if your left margin is at one inch and you set a tab stop at two inches, when you change the left margin to 0.5 inches, your tab stop will automatically change to 1.5 inches. A tab can also automatically adjust when its alignment is redefined. When you change a center tab to a right aligned tab, the tabbed text immediately changes from a centered position to a right aligned position. The results of these tab changes are immediately visible on your display.

Expanded Merge

Several merge features have been improved upon. The merge codes are now easier to understand and more powerful to use. Merge commands can now be used inside headers/footers, footnotes/endnotes, and text boxes. The new version also contains a more efficient merge language with which you can select records based on the information contained in specific fields. For example, you could select and merge only those records for which the province is Ontario and the education level is 12 years and above.

Dictionary-based Hyphenation

In previous versions of WordPerfect, hyphenation was based on a computer algorithm (termed as "mathematical best guess" by WP Corp). WordPerfect 5.1 has a more accurate, dictionary-based hyphenation feature now. Moreover, the Speller and Hyphenation dictionaries have been combined into one file, so they need less disk space than before.

Ordering WordPerfect 5.1

According to WordPerfect Corporation, the suggested price for WordPerfect 5.1 will remain the same as version 5.0 at US$495. Upgrades from any version of WordPerfect will be available for US$85, including a new manual binder and slipcase (US$75 if you don't want the larger binder and slipcase). Once the upgrade is on the market, it can be ordered by sending US$85 (plus $10.00 for shipping and handling) and the title page of your current WordPerfect manual to:

WordPerfect Corporation
Canada Orders
81 North State St.
Orem, UT 84507
USA

Please specify the type of computer and printer you are using and preferred disk size (5.25 inch or 3.5 inch). For more detailed information, contact the Canadian Orders Desk, WordPerfect Corp. at 1-800-446-4652.

For further information about WordPerfect 5.1, contact Harriet Hua Ji at 978-6050.

Microsoft Word 4.0 for the Macintosh

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Microsoft has added a host of features to Microsoft Word 4.0, the latest version of one of the most powerful word-processors available on the Macintosh. Though not a new product, it is a substantial improvement over Word 3.02. Here are some of the changes:

Page View

Microsoft has responded to users who wish to edit in WYSIWYG (What You See Is What You Get) mode by creating Page View. In Word 3.02, editing is done in a fast text view that does not show headers, footers or footnotes as they will print. In Page Preview, you can see the output page, but you cannot edit the text. Those familiar with other Macintosh word-processors know that one of the standard features is WYSIWYG editing. To remedy this situation, Microsoft has added a Page View that allows you to see the whole page and edit text. The other views are still available, since text view provides speedier editing and Page Preview allows you to see the whole page in miniature.

Page View does have its problems. It is slow with complex documents on older machines. For this reason, Microsoft gives you the option of turning off Page View, in order to edit text more efficiently. Secondly, Page View allows you to edit only one page at a time. As you scroll past the end of a page, you do not see the next page coming up. Instead, the page disappears unexpectedly, and the top of the next page appears. It is like having an inside hand flip the page for you. This annoyance somewhat spoils the powerful full-page editing environment.

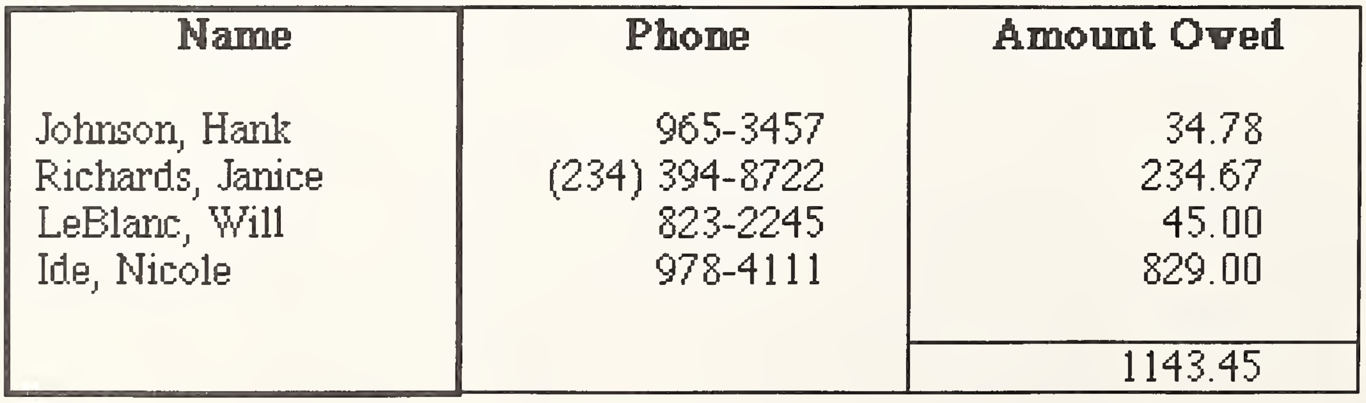
Outlining

The much improved Outline View is now a useful tool. You can grab headings with the mouse for promotion or demotion. Subheadings can be collapsed or expanded into headings. Microsoft has integrated the features of an outliner (e.g., Acta) into Word 4.0. Working with the outliner can, however, be dangerous, as you can move or delete large amounts of text with a flip of your wrist. Even so, it is worth it to be able to outline ideas and flesh them out in one environment.

Table Generation

Another welcome feature is the table generation tool. Instead of playing with tabs to generate a table, one command prompts you through the process. You specify the average width and number of columns which you desire, and Word creates a small spreadsheet within your document. Columns can be individually controlled and given borders. Information can be entered into a column without having to tab over to the column for each new row. You need only hit the Return key to start a new line in a column. The table tool will be a welcome addition for those who have to enter large amounts of numbers in columns. See *Figure 1*.

Figure 1



Name	Phone	Amount Owed
Johnson, Hank	965-3457	34.78
Richards, Janice	(234) 394-8722	234.67
LeBlanc, Will	823-2245	45.00
Ide, Nicole	978-4111	829.00
		1143.45

Menus

Microsoft Word now gives you control over all menus. A command tool allows you to lay out your menus as you wish, removing the features you do not use, and rearranging features under different menus. You may also assign command-key equivalents to menu items so that Word will work like your other favorite word-processor. When you buy Word 4.0, it comes with MacWrite and WriteNow menu-settings files so that MacWrite and WriteNow users can use menu layouts similar to those to which they are accustomed.

Font Changes

Microsoft has fixed some of the "ugly" features of Word 3.02. In the previous version, there were two lists of fonts. Under the Font menu you were presented with a short list of fonts loaded from a complete list under the Format/Character menu. You had to move the fonts you chose into the short menu using the Option-Command-Plus trick. Many of us were bewildered when fonts we had loaded into the system did not appear in the Font menu. Now, all fonts are in one menu where they should be.

Free Software

Word 4.0, if you buy it at the full price, comes with three additional programs: SuperPaint, AutoMac III, and WordFinder. SuperPaint is a graphics program that combines features from MacPaint and MacDraw into a single package. The version included with Word 4.0 is SuperPaint 1.2 (not the most recent version), but an upgrade is available for an additional fee. AutoMac III 2.1 is a macro recorder that can play back a sequence of operations at a single key-stroke. AutoMac provides Word with a macro facility, but it will also work outside of the program. WordFinder is an on-line thesaurus. You select a word (inside Word), choose WordFinder from the menu, and it will give you list of synonyms for the word. If you wish, it will replace the original word with the chosen synonym.

As of November 1st, you can buy the academic version of Word 4.0 for CDN$130. This price includes AutoMac III, WordFinder, a reference guide, and a "Getting Started" manual. The full package, including SuperPaint and full documentation, is approximately CDN$350.

Not Yet Perfect

In conclusion, Word 4.0 is a marked improvement over 3.02, but is still far from perfect. I still feel that it was designed with little attention to the integration of features. The proliferation of views is a symptom of this. Instead of providing a clean WYSIWYG mode, Word 4.0 gives you a jumpy Page View and Page Preview. The collection of free, additional software is a response to competition from companies like WordPerfect, who have integrated both macros and a thesaurus into their word-processors. In some ways, having a separate but compatible product is preferable. It will work independent of Word. On the other hand, a separate product may not work as well within the application. The macros in WordPerfect or Nisus are better integrated as part of the program.

For further information about Word 4.0, contact Geoffrey Rockwell at 978-4548.

Publish it Yourself!

Dr. A.D. Irvine

Kristen Rosbak
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Traditionally, manuscripts submitted for publication were plain, double-spaced pages of type produced on a typewriter or, more recently, a word processor. They were finished, as far as the author was concerned, but were not completed (or "camera-ready") yet. This camera-ready copy was, usually, the product of the publisher and an expensive typesetting machine. Lately, word-processing and desktop publishing software packages, and laser printers, have become more powerful and more affordable, making it possible to create your own camera-ready copy. (Note: laser-printed copy provides an exact document proof. Once okayed by the publisher, the same word-processing file can be printed on a typesetter, providing true camera-ready copy. Some publishers will accept laser output as camera-ready copy.)

There are several benefits to producing your own camera-ready copy. These include having greater freedom over layout, font styles, etc., than are available with many publishers, and having greater control over production schedules. In effect, you cut out much of the time-consuming interchange between author and publisher, so it is also possible to produce the book more quickly. Because this method reduces production requirements for the publisher, many of the costs saved can be passed on to you, the author, in the form of a commission for the production of copy. Most publishers normally pay anywhere in the neighbourhood of $5 to $7.50 per page of copy.

Dr. A.D. Irvine, the editor of *Physicalism in Mathematics* (Kluwer Academic Publishers, 1989), a compilation of articles from outside sources, can attest to these facts. Using Microsoft Word 3.02 , a MacPlus, and a laser printer, he produced his own camera-ready copy. Formerly a professor at the University of Toronto, Dr. Irvine has been kind enough to supply UTCS with some hints for self-production of camera-ready copy, as well as some examples of his book.

Production of camera-ready copy does require more work than producing an ordinary manuscript. In particular, attention must be paid to the kind of typesetting details which are normally left to the publisher. You are not just acting as writer here, but as editor and typesetter as well. Since few things are more annoying than a book riddled with typos or one which is poorly or unprofessionally laid out, it is essential that you not take shortcuts in this area. Nevertheless, none of the work requires an unreasonable amount of time or insight.

The main thing is to work with your publisher. Together you must decide how to lay out all of the printed text within your book. The following are some of the key points on which you must agree:

1. Define the text size, font, and spacing. Choose your fonts from the publisher's printouts. On-screen presentation is not always a good representation.

2. Does the text vary for footnotes? Are footnotes to be numbered?

3. Quotations: should they be offset?

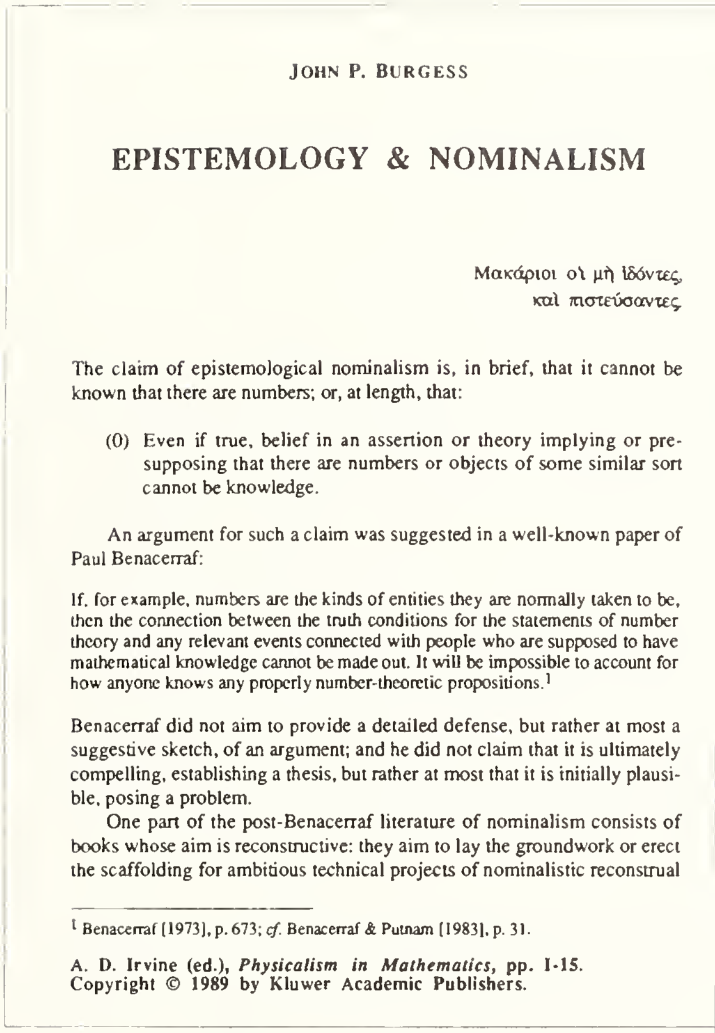
4. Titles: are they larger than normal text? Bold? Define and store your layout styles for later use. For consistency, remember to save the required styles with each file (assuming chapters will be stored as separate files). Redefining styles for each file may give rise to slight variations.

5. Will the book have headers and footers? With Microsoft Word's **Facing Pages** command, you can run different headers and footers on even and odd numbered pages. The **First Page Special** command allows for the change or elimination of the header and/or footer on the first page of each chapter.

6. Should paragraphs be indented or separated?

7. Special items, i.e., spaces accompanying dashes: are there any items unique to your publisher's style?

The results speak for themselves. Figures 1 and 2 are sample pages from Dr. Irvine's book. Of note are the footnotes, optional footer, and technical fonts, easily handled by Microsoft Word.



JOHN P. BURGESS

EPISTEMOLOGY & NOMINALISM

Μακάριοι οἱ μὴ ἰδόντες,
καὶ πιστεύσαντες

The claim of epistemological nominalism is, in brief, that it cannot be known that there are numbers; or, at length, that:

(0) Even if true, belief in an assertion or theory implying or presupposing that there are numbers or objects of some similar sort cannot be knowledge.

An argument for such a claim was suggested in a well-known paper of Paul Benacerraf:

> If, for example, numbers are the kinds of entities they are normally taken to be, then the connection between the truth conditions for the statements of number theory and any relevant events connected with people who are supposed to have mathematical knowledge cannot be made out. It will be impossible to account for how anyone knows any properly number-theoretic propositions.[1]

Benacerraf did not aim to provide a detailed defense, but rather at most a suggestive sketch, of an argument; and he did not claim that it is ultimately compelling, establishing a thesis, but rather at most that it is initially plausible, posing a problem.

One part of the post-Benacerraf literature of nominalism consists of books whose aim is reconstructive: they aim to lay the groundwork or erect the scaffolding for ambitious technical projects of nominalistic reconstrual

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[1] Benacerraf [1973], p. 673; *cf.* Benacerraf & Putnam [1983], p. 31.

A. D. Irvine (ed.), ***Physicalism in Mathematics***, pp. 1-15.
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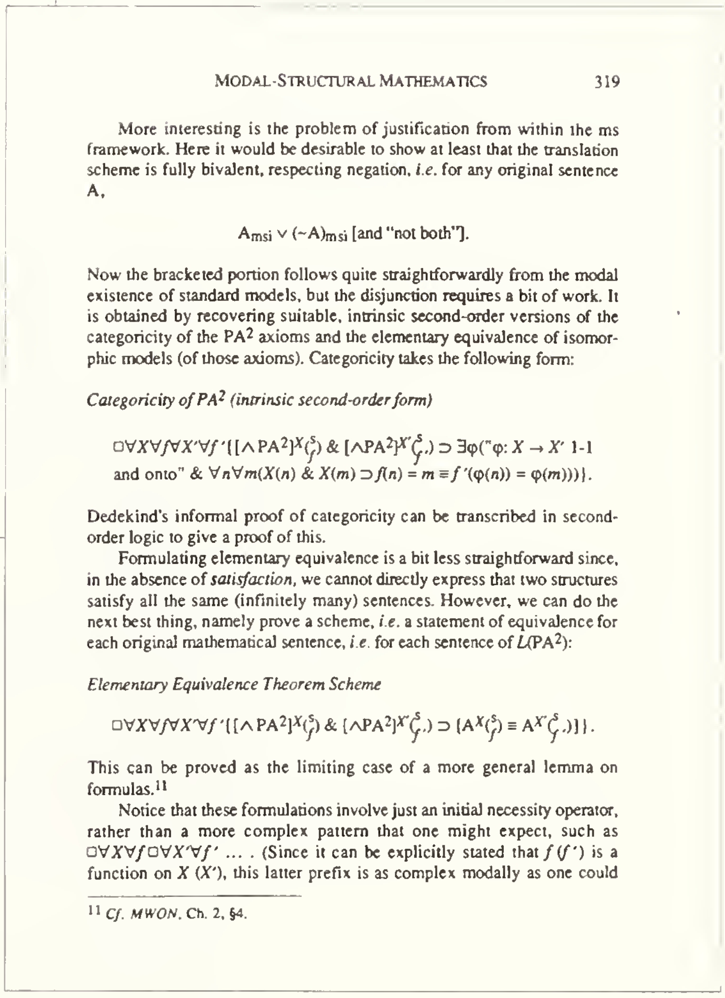
Figure 1



More interesting is the problem of justification from within the ms framework. Here it would be desirable to show at least that the translation scheme is fully bivalent, respecting negation, *i.e.* for any original sentence A,

$$A_{msi} \vee (\sim A)_{msi} \text{ [and ``not both'']}.$$

Now the bracketed portion follows quite straightforwardly from the modal existence of standard models, but the disjunction requires a bit of work. It is obtained by recovering suitable, intrinsic second-order versions of the categoricity of the PA^2 axioms and the elementary equivalence of isomorphic models (of those axioms). Categoricity takes the following form:

Categoricity of PA^2 (intrinsic second-order form)

$$\Box\forall X\forall f\forall X'\forall f'\{[\wedge PA^2]^X\binom{s}{f} \mathbin{\&} [\wedge PA^2]^{X'}\binom{s}{f'} \supset \exists\varphi(\text{``}\varphi: X \to X' \text{ 1-1 and onto''} \mathbin{\&} \forall n\forall m(X(n) \mathbin{\&} X(m) \supset f(n) = m \equiv f'(\varphi(n)) = \varphi(m)))\}.$$

Dedekind's informal proof of categoricity can be transcribed in second-order logic to give a proof of this.

Formulating elementary equivalence is a bit less straightforward since, in the absence of *satisfaction*, we cannot directly express that two structures satisfy all the same (infinitely many) sentences. However, we can do the next best thing, namely prove a scheme, *i.e.* a statement of equivalence for each original mathematical sentence, *i.e.* for each sentence of $L(PA^2)$:

Elementary Equivalence Theorem Scheme

$$\Box\forall X\forall f\forall X'\forall f'\{[\wedge PA^2]^X\binom{s}{f} \mathbin{\&} [\wedge PA^2]^{X'}\binom{s}{f'} \supset [A^X\binom{s}{f} \equiv A^{X'}\binom{s}{f'}]\}.$$

This can be proved as the limiting case of a more general lemma on formulas.[11]

Notice that these formulations involve just an initial necessity operator, rather than a more complex pattern that one might expect, such as $\Box\forall X\forall f\Box\forall X'\forall f'$ … . (Since it can be explicitly stated that f (f') is a function on X (X'), this latter prefix is as complex modally as one could

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[11] *Cf. MWON*, Ch. 2, §4.

Figure 2

PageMaker and Images

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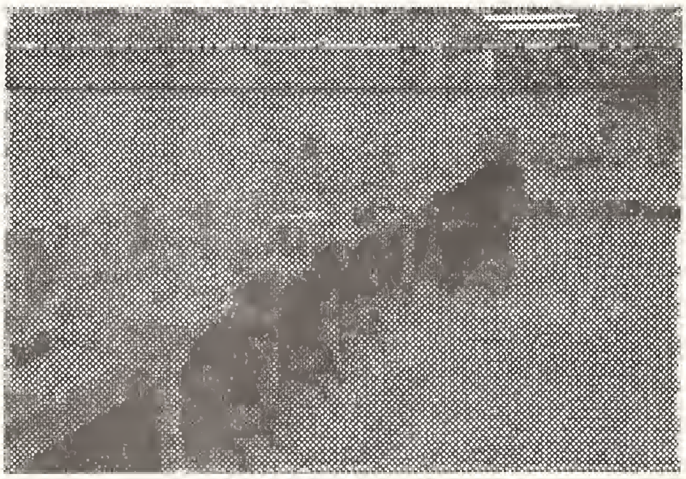
UTCS uses PageMaker to produce *ComputerNews*. Text, drawings, and images are placed in a PageMaker publication and output directly to our PostScript laser printer for proofing. This same publication is then sent to the Linotronic PostScript typesetter for final camera-ready, photographic paper output. This is then sent to a print shop for offset printing.

This works well most times, but occasionally the results are not as spectacular as we expect. Text, rules, boxes, and drawings are generally not a major problem. Images are often a problem! When I say images, I am referring to pictures containing many different shades of grey, like black-and-white photographs where areas are black or white or any shade in between.

Typical images in *ComputerNews* include scanned photographs, digitized video tape frames, and computer screen captures. Photographs are scanned into the computer using a DEST scanner. Video taped images are digitized using a special device called a frame grabber. Computer screens are captured using special programs that read the computer video memory. You may wonder why computer screen captures fall into my category of images. Most of the computer screens we capture are colour screens. These are represented with different shades of grey when reproduced in black and white.

The common problems when using images with PageMaker are:

- Linked image files
- Screen frequencies
- Brightness and contrast



Micro lab image taken from video tape. No options selected.

Linked Image Files

When you place an image smaller than 64 kilobytes (KB) into a PageMaker publication, all the image data is brought into the publication file. Once placed in the publication, you can delete the original image file. When this publication is printed, the image data contained in the publication is sent to the printer. When you place images larger than 64KB, PageMaker does not load all the image data into the publication. Instead, it links to the image file. When a placed image is linked, only sufficient data for a rough screen preview is actually brought into the publication. The bulk of the data is retained in the actual image file. When this publication is printed, the image data needed for best-quality printer output is taken from the original image file. Since PageMaker keeps track of where that particular image file was located on your disk, this original file needs to be available on disk for PageMaker to find it. If you open up a PageMaker publication and it asks you about linking, then an image file that was linked has been removed, renamed, or deleted and PageMaker wants to know where it is. If you ignore the link, then PageMaker will do the best it can with the rough screen view of the image contained in the publication. If you link to the wrong image file, you will get unpredictable results. Linking to the correct image file (wherever it is located) is the easiest way to get high-quality output.

Screen Frequencies

Black-and-white printing equipment, such as laser printers and printing presses, can make areas either black or white. To print the various shades of grey needed for images, fine spot patterns must be used. The size of the spots, and the amount of white area around each spot, varies. This screening, as it is called, fools the human eye into thinking an area is grey. The number of spots used to simulate grey patterns depends on a number of variables including the resolution of the output (number of dots per inch) and the number of different shades of grey that are needed for the image. Laser printers for proof prints have a resolution of 300 dots per inch, and the Linotronic typesetter for final photographic quality output has a resolution of 1270 dots per inch. PageMaker uses a 53 line screen frequency (53 spots per inch) by default when printing. This is fine for the 300 dpi laser printers but for the Linotronic we can use a higher screen frequency to get better results. UTCS normally uses a 90 line screen. The screen frequency is set using the Image Control options in PageMaker. Failure to set this screen setting according to the output device results in unnecessary coarseness in the final output.

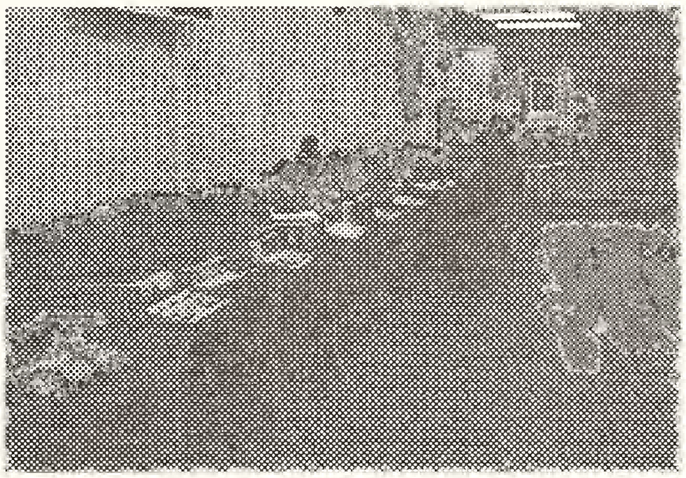


Image control used to lighten image.

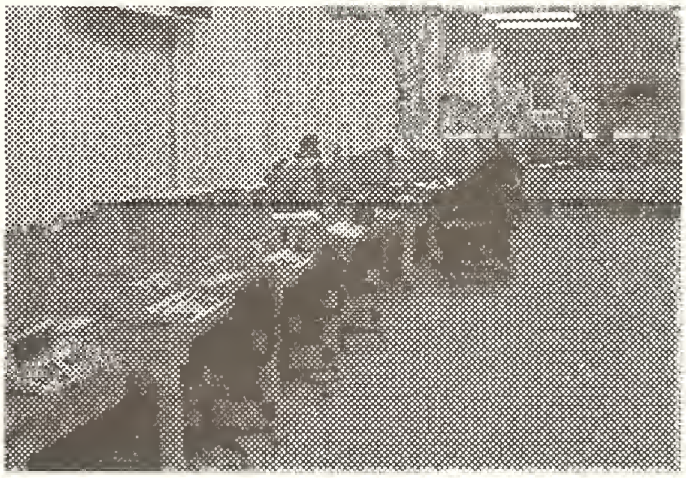


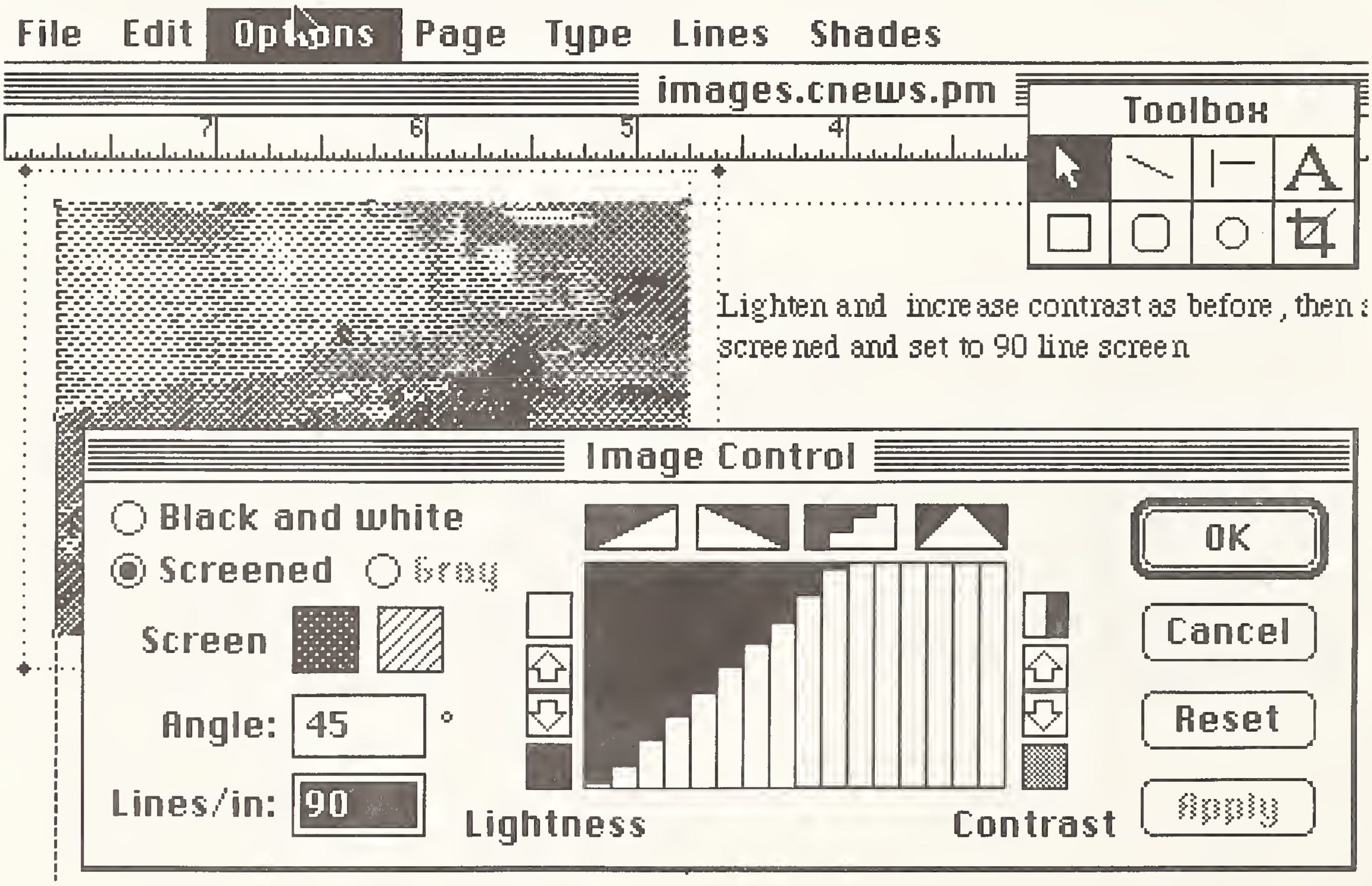
Image control used to lighten and increase contrast.

Brightness and Contrast

The Brightness and Contrast controls in PageMaker's Image Control are identical to the controls on your television. On your television, you see the contrast or brightness problems immediately and can make adjustments to correct them. When using images in PageMaker, you often don't see the problem until the document is laser-printed. Then you have to adjust and print until you get it right. For camera-ready ouput, the cycle has three steps: adjust, typeset, and offset print. In both cases, the results are not exactly as you see them on the screen. Experience and experimentation are the best ways to adjust contrast and brightness but, in general, images get darker through each step. Contrast may need little or no adjustment, depending on the quality of the original image.

Lighten and increase contrast as before, then select screened and set to 90 line screen.

Image control window adjusting screen and contrast of illustration in background.



Lighten and increase contrast as before, then
screened and set to 90 line screen

○ Black and white

● Screened ○ Gray

Angle: 45 °

Lines/in: 90

Ihor’s Unfamiliar Quotations

(with apologies to Mr. Bartlett)

Ihor Prociuk
ihor@vm.utcs.utoronto.ca

Now that we have mastered the intricacies of the five kinds of dashes (see “The Dash—More than Just a Straight Line” in the October 1989 issue of *ComputerNews*), we press on with Quotation Marks.

Prior to the invention of word processing, typists were severely restricted in the use of quotation marks. On typewriters there were only two kinds of quotation marks:

" and '

The single quote (') was used as the apostrophe in contracted words (like don't) or possessive adjectives (like Fred's car). Since double quotes (") were used to indicate someone was speaking or that some material was being quoted from another source, the potential for confusion was enormous. Take the following for example:

> "Wait a minute," said Fred. "Did you say to Judy, " "I mean what I say" is the same as "I say what I mean"?" But that's silly! Remember what the Mad Hatter said to Alice at the tea party: "Not the same thing a bit! Why you might just as well say that "I see what I eat" is the same thing as "I eat what I see"! "."

It’s hard to tell which text belongs to which quotation!

Most word processing packages on microcomputers allow proper quotation marks to be used and displayed. Proper quotation marks look like this:

“. . .” and ‘. . .’

To produce quotation marks on the Macintosh, in any word-processing program using “regular” fonts, use the following key combinations:

Option-[	to create	“	(left) opening double quotation mark
Option-Shift-[	to create	”	(right) closing double quotation mark
Option-]	to create	‘	(left) opening single quote mark
Option-Shift-]	to create	’	(right) closing single quote mark

Note that the double quotation marks may not appear in their proper form on the screen when using some fonts (e.g. Helvetica). Also, when using very small font sizes (less than 9 point), it becomes hard to distinguish between " and “.

On the PC in WordPerfect 5.0, the opening single quote (‘) is usually found on the same key as the tilde (~). On most keyboards, it is the key to the left of the 1 key along the top row of the keyboard. The closing single quote (’) is on the same key as the now-illegal double quote (“), usually to the left of the Return key. To get the opening double quotation mark (“), use the **Compose** feature: Ctrl-V 4,32. The closing double quotation mark (”) is also a **Compose** function: Ctrl-V 4,31.

Because there are both opening and closing single and double quotation marks, these can be used to guide the reader and help identify when a quotation starts and ends or when a person’s “speech” starts and ends.

The general rule to follow is: In instances where quoted words, phrases, and sentences are in the body of the text, they are enclosed in double quotation marks. Single quotation marks enclose quotations within quotations; double marks, quotations within these; and so on. Thus, the above example becomes:

> “Wait a minute,” said Fred. “Did you say to Judy, ‘ “I mean what I say” is the same as “I say what I mean”?’ But that’s silly! Remember what the Mad Hatter said to Alice at the tea party: ‘Not the same thing a bit! Why you might just as well say that “I see what I eat” is the same thing as “I eat what I see”! ’.”

Isn’t that better?

Microcomputer Short Courses

Irene Rosiecki
rosiecki@vm.utcs.utoronto.ca

UTCS offers various noncredit microcomputer courses to faculty, staff, and graduate students of the University of Toronto. These courses cover a number of software programs available for the PC or the Macintosh. Whether you will be typing a thesis on a word processor, or working with spreadsheets, databases, or desktop publishing, we may be able to help you get started.

Our class sizes are small, to allow for much individual attention. Continuing support is available upon completion of a course.

The following is a list of the microcomputer courses taught at UTCS:

Introduction to dBASE IV
Introduction to Desktop Publishing
Introduction to Disk Operating System (DOS)
Electronic Mail Seminar
Excel on the Macintosh
Introduction to HyperCard
Introduction to Lotus 1-2-3
Introduction to PageMaker
ProComm Communications Seminar
Introduction to SAS on the PC
Intermediate Applications of SAS on the PC
Microsoft Word on the Macintosh
Microsoft Word on the PC
Introduction to WordPerfect 5.0
Advanced WordPerfect 5.0 Topics
Introduction to WordPerfect 5.0 for 4.2 Users

To find out about course dates and registration procedures, or to book a place in any of these courses, please contact Irene Rosiecki at 978-4565. Courses are filled on a first-come, first-served basis. The more popular courses fill up quickly, but waiting lists are maintained in case of cancellations.

There will be a free demonstration of the NeXT computer on Wednesday, December 13, from 2:30 p.m. - 4:30 p.m. Space is limited, so call early to register.

Documents at UTCS

Vendor-produced documentation may be ordered through the UTCS Information Office, Room 201, 4 Bancroft Avenue. UTCS documents and selected vendor documents are also stocked there for purchase. For more information on prices, call 978-4990. Whenever feasible, documents are made available online, and users are encouraged to print their own copies. On the VM machine, a special command has been provided for this purpose.

To print online documents on:

IBM VM/CMS	***GP UNIX***
Type "help document"	Use *ipr* command

The following examples relate to the table below. The document to be printed is the UTCS Guide to Census Tapes, called CENSUS LISTING on CMS and /usr/doc/utcs/census on GP UNIX. <RETURN> means RETURN or ENTER key.

```
CMS:      document <RETURN> <RETURN>
          laser census listing (forms yxle <RETURN>

GP UNIX:  nohup ipr -8p -fyxle /usr/doc/utcs/census & <RETURN>
```

UTCS Documents in hardcopy

New:

UTCS Rate Schedule (Commercial)
UTCS Rate Schedule (External)
UTCS Rate Schedule (Internal)

Previously announced:

Academic's Guide to Microcomputer Systems
Character Sets for Highspeed Printing
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics

Previously announced:

UTCS GUIDE TO PRODUCTS AND SERVICES: Accounting
UTCS Catalogue: Numerical Products
UTCS Catalogue: Statistics Products
UTCS Catalogue: Text Products
UTCS Guide to Census Tapes
UTCS Guide to Kermit
UTCS Guide to Micro File Transfer Service
UTCS Guide to Text Processing on GP UNIX

UTCS Documents online

	CMS LISTING	GP UNIX	Forms Code
Recently Updated:			
UTCS Guide to Highspeed Printing	PRINT		*
UTCS Guide to VM/CMS	CMSGD		*
UTCS Guide to WScript	WSCRIPT		*
Recently Removed:			
UTCS Guide to Scribe			
UTCS Guide to TFW.MAK in Scribe			
Previously announced:			
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction	INTRO	/usr/doc/utcs/intro	*
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics	BASICS	/usr/doc/utcs/basics	*
UTCS Catalogue: Access, Part 1	ACCESS1	/usr/doc/utcs/access1	*
UTCS Catalogue: Access, Part 2		/usr/doc/utcs/access2	*
UTCS Catalogue: Numerical Products	NUMCAT		*
Product-Function List	NUMLIST		BXQD
UTCS Catalogue: Statistics Products	STATCAT		*
Product-Function List	STATLIST		BXQD
UTCS Catalogue: Text Products	TEXTCAT	/usr/doc/utcs/textcat	*
UTCS Guide to BMDP	BMDP		*
UTCS Guide to Census Tapes	CENSUS	/usr/doc/utcs/census	*
Recipes for Using Tapes on VM/CMS	QUIKTAPE		*
UTCS Guide to FORTRAN on VM/CMS	FORTRAN		*
UTCS Guide to GP UNIX		/usr/doc/utcs/gpunix	*

* *Recommended forms code for the 8700 is YXLE unless otherwise stated.*
† *Use the 87set command. Type "help 87set".*

Documents continued

UTCS Documents online continued

	CMS LISTING	GP UNIX	Forms Code
UTCS Guide to Kermit	KERMIT	/usr/doc/utcs/kermit	*
UTCS Guide to Micro Laser Printing Service	MICRLASR		*
UTCS Guide to SAS	SAS		*
UTCS Guide to Series/1 Terminal Use	SERIES		*
3270 Emulation:			
Cybernex APL100 and Volker Craig VC404	CYBER		*
DM1520	DM1520		*
Hardcopy Terminal	HARDCOPY		*
IBM 3101	IBM3101		*
IBM PC Kermit	PCKERMIT		*
SOROC IQ	SOROC		*
VT52	VT52		*
VT100	VT100		*
UTCS Guide to SPSS	SPSS		*
UTCS Guide to Text Processing on GP UNIX		/usr/doc/utcs/text	YXOG

Other Documentation online

	CMS LISTING	GP UNIX	Forms Code
Electronic Mail			
A User's Guide to Electronic MAIL	MAILBOOK		YXOC
Kermit			
Kermit Protocol Manual	KERMITPM		YXOE
Kermit User Guide	KERMITUG		YXOF
ProComm			
ProComm Reference Manual	PROCOMM		YXOE
VMBATCH Documents			
VMBATCH User's Guide	VMBATCH		YXOA
VMBATCH Messages and Codes	VMBATMC		YXOA
VMSECURE			
VMSECURE User's Guide	VMSECURE		YXOE
VM Tape Documents			
TapeMap User's Guide and Reference	TAPEMAP		*
VMTAPE Messages and Codes	VMTMSGS		YXOE
VMTAPE User's Guide	VMTUSER		YXOE
Waterloo SCRIPT			
Reference Manual	WSCRPTRF		YXLC
User's Guide	WSCRPTUG		YXLC
Using SCRIPT in MVS/TSO	WSCRPTSO		YXLC
Waterloo SCRIPT and a PostScript Printer	WSCRPTPS		YXLC
Formula Processor Summary	WSCRPTFP		YXLC
GML User's Guide	GMLUG		YXLC
GML Reference Summary	GMLRFSUM		YXLC

* *Recommended forms code for the 8700 is YXLE unless otherwise stated.*

† *Use the 87set command. Type "help 87set".*

Consulting and Enquiries

Applications Support & Advising Supervisor	Alex Nishri	BC214	978-7109
External Marketing Consultant	Ihor Prociuk	BC217	978-6875
Erindale College	Joe Lim	ER2035	828-5311
Information Office	Shirley MacLeod	BC201	978-4990
Account & Access Code Enquiries	Sylvia May	BC101B	978-7148
IBM & Macintosh Maintenance	Kam Mark	BC103	978-5050
Network Operations Support	Geoffrey Chun	BC102	978-3787
Tape Library (Academic Services)	Susan Kovago	MP368	978-7319
Tape Library (Administrative Services)	Miranda Fong	MP368	978-6693
Terminal Service	Rosi Tseu	BC105	978-7087
UTCS Noncredit Short Courses	Irene Rosiecki	BC217	978-4565

Consulting & Advising Services:	978-HELP
CMS, and GP UNIX userids:	ADVISOR
CMS Userid for mail problems:	POSTMSTR
System Status Enquiries (GP UNIX)	978-4318
System Status Enquiries (IBM)	978-7393
Interactive Services 300 (bps)	978-3959
Interactive Services 1200 (bps)	978-3959
Interactive Services 2400 (bps)	978-7239

UTCS Directory

Director:	Dr. Warren Jackson	BC118	978-8948	wcj@vm.utcs.utoronto.ca
Associate Director:	Eugene Siciunas	BC116	978-5058	eugene@vm.utcs.utoronto.ca
Managers:				
Communications &Technical Support	Norman Housley	BC121B	978-4967	norman@vm.utcs.utoronto.ca
Information Centre	Don Gibson	BC217	978-7331	don@vm.utcs.utoronto.ca
Internal Systems Support	Ron Vander Kraats	BC121A	978-4428	rvk@vm.utcs.utoronto.ca
Operations Support	Dr. Bob Chambers	MP350	978-7092	
Systems Support	Bill Lauriston	MP331	978-3579	bill@vm.utcs.utoronto.ca

Committees on Computing

Supercomputer Users' Group at U of T	Chair	Prof. W.R. Peltier	978-2938
Research Board Standing Committee on Computing	Chair	Prof. C.C. Gotlieb	978-2986

Legend

BC = Bancroft Building
ER = Erindale
MP = McLennan Physical Labs

* NetNorth/BITNET/EARN

UTCS Terminal and Advising Sites

Names and Locations

Central Advising Office (CAO), 978-HELP
Engineering Annex (EA, CDF), 11 King's College Road, Rooms 103, 107, 107B, 201, 203
Erindale College (Erin), 828-5339, Mississauga Road, Erindale Campus, Rooms 2037, 2039A-B-C, 2045
Robarts, Robarts Library, 130 St. George St., Room 1061A
Sidney Smith (Sidney), 100 St. George St., Rooms 1071, 2105
St.Michael's College, 121 St. Joseph St., Room 107
Trinity College, 6 Hoskins Ave., Room 024
Victoria University, 73 Queens Park Cres., Room 208

Access Hours

Sites	Hours of Access				Restrictions*	Advising
	Mon-Thurs	Fri	Sat	Sun		
CAO	10:00-18:00	10:00-18:00	closed	closed	Research	978-HELP
CDF	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	No
EA	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Erin (2039)Δ	9:00-17:00	9:00-17:00	12:00-16:00	12:00-16:00	Research	Rm 2005
(2045-46-47)	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	Rm 2005
(235)†	8:00-22:00	8:00-17:00	closed	closed	None	Rm 2046
Robarts	8:30-24:00	8:30-24:00	9:00-22:00	13:00-22:00	None	978-HELP for Research
Sidney	7:00-24:00	7:00-24:00	7:00-24:00	7:00-24:00	None	978-HELP for Research
St.Michael's	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Trinity	8:00-22:00	8:00-22:00	8:00-22:00	8:00-22:00	None	978-HELP for Research
Victoria	8:30-21:00	8:30-21:00	8:00-13:00	8:00-13:00	None	978-HELP for Research

Sites	Advising Hours
CAO	Monday through Friday, 10:00 - 18:00
Erin	Monday through Friday, 09:00 - 22:00

Legend

* Research includes graduates, faculty, staff.
Δ Key access available.
† Access restricted to building hours.

Computer and Printer Access

Sites	PACX	Printers	CDF/PC Microcomputers
CDF	N	Y	N
EA	Y	Y	N
Erin	Y	Y	N
Robarts	Y	Y	Y †
Sidney	Y	Y	Y††
St.Michael's	Y	Y	Y††
Trinity	Y	Y*	Y††
Victoria	Y	Y*	Y††

(Y=yes, N=no)

* CDF/PC only † NEC †† TI/PC

UTCS Services

UTCS Centrally Owned and Managed

Systems

IBM VM/CMS
Technical Assistance: 978-6602

- General Purpose Timesharing environment
- Hub of the NetNorth network with access to BITNET, EARN and the Internet
- 4381-R02 processor with 32 megabytes of memory
- CP operating system, VM/SP HPO R4.2
- CMS timesharing system, VM/SP Release 4
- FTP and TELNET access to the campus ethernet, as well as Internet
- RSCS spooling system, Release 2.3

GP UNIX
Technical Assistance: 978-8853

- General Purpose Timesharing under SUN UNIX 3.2
- SUN 3/280, 8 megabytes of memory
- access to Linotronic typesetter
- offers a sophisticated and powerful environment for text processing
- offers a sophisticated programming environment suitable for commercial software development or testing
- full access to USENET, an electronic technical information exchange facility
- offers excellent electronic mail facilities and ability to send or receive mail from most computer networks worldwide, such as UUCPNET, ARPANET, NetNorth, BITNET, CSNET, CDNNET

Services

Communications & Technical Support
Primary Phones: 978-3787, 978-4967

- Communications Group provides communications systems, terminals, modems, data channels: consulting and installation.
- Field Service Group installs and maintains communications and computer systems, particularly IBM PCs, Micro Vaxes, and Macintoshes, on a contract basis or on a cost-per-call basis.
- provides consulting on computer systems technology and installs computer systems
- provides access between the IBM systems and machines using UNIX, VMS and other operating systems. Ethernet, Pronet, and IBM TRN technologies are used over various transmission media including optical fibre. More basic communications techniques are also used for moderate speed links.
- provides consulting on local area networking and installs LANS
- provides access to NetNorth (BITNET), the North American Universities Network; ONET, the Ontario Regional Network; and USENET, the UNIX networking fraternity
- provides gateway to the US Internet
- will provide a communications solution to department needs on a contractual basis

Information Centre
Primary Phone: 978-HELP

- Provides assistance in use of electronic messaging, including use of Local Area Networks (LANS); NetNorth/BITNET/EARN, the world Universities network; CDNNET, the Canadian X.400 network; ARPANET; CSNET; USENET; and other international connections.
- provides advising, consulting and documentation on:
    - command languages, including CMS and UNIX
    - high level languages, including FORTRAN, and PL/I
    - packages and libraries, including SAS, SPSS, BMDP, IMSL, and NAg
    - editors and formatters, including XEDIT, ed, nroff/troff
- provides general micro support
    - selection consulting for hardware and software
    - Micro Lab for evaluation of hardware and software
    - advice on University discounts
    - media conversion and data transfer
    - CD-ROM access to software and information discs
    - offers Micro Laser Printing Service
    - offers 35mm slide production service using Polaroid Palette
    - administers Local Area Network of PCs for Education Facility
    - administers Macintosh Education Facility
- high quality typesetting
- installs and maintains application packages
- administers site licenses for various software packages
- provides short courses and seminars on the more popular services and software packages

> *The mandate of UTCS is to encourage and support the use of information technologies across campus, and to plan, implement, and operate common-carrier networks and certain appropriate central computer facilities.*

Facilities Managed by UTCS

Administrative Computing

- administrative IMS, DB2, Batch, and TS0
- 3081K processor, 48 megabytes of memory
- MVS/XA operating system

Computer Disciplines Facility/UNIX

SUN 3/280s, 16 megabytes of memory (zero.cdf)
- Computer Science interactive access
- SUN UNIX 4.0.3

SUN 3/280s, 16 megabytes of memory (one.cdf)
- Computer Science interactive access
- SUN UNIX 4.0.3

Computer Disciplines Facility/PC

- 40 NEC computers connected in a Local Area Network
- 66 TI Professional Computers connected in a Local Area Network
- introductory Computer Science instruction
- MS-DOS with Turing environment

Erindale College Systems

VAX 8200, 8 megabytes of memory
- instructional access using VMS
- research access

VAX-11/750, 5 megabytes of memory
- instructional access using UNIX (Berkeley UNIX 4.3BSD)

Institutional Relations System

VAX-11/750, 8 megabytes of memory
- database services to the owner departments using VMS

EPAS Facility

- 4361-5 processor, 16 megabytes of memory
- general VM/CMS services to the owner departments

Ontario Centre for Large Scale Computation (OCLSC)

- Cray Research Inc. X-MP/24
- 2 processors, 4 megawords main memory
- solid state disk (SSD) with 64 megawords of storage
- COS 1.17 operating system
- VAX 8350 + MicroVAX II and VAX750 provide VMS front-end services

Software List

SOFTWARE LIST for MICROCOMPUTERS

The following are microcomputer software packages for which UTCS can provide either support or some information. As with mainframe products, micro packages receive full support (Class A), limited support (Class B), or no active support (Class C). The specific criteria differ from those for mainframe classes and are outlined in the Academic's Guide to Microcomputer Systems.

Package/Compiler	Version	Environment	Support
Application Development Tools			
Assembler			
Microsoft Assembler	5.1	MS-DOS 3.3 & OS/2	B
MPW Assembler	2.0.2	Macintosh	B
BASIC			
GW BASIC	—	MS-DOS	B
C			
Microsoft C	5.1	MS-DOS	B
MPW C	2.0.2	Macintosh	B
WATCOM C & Express C	6.0	MS-DOS	B
FORTRAN			
IBM FORTRAN/2	1.0	MS-DOS 3.3 & OS/2	B
Language Systems FORTRAN	1.0	Macintosh	C
Microsoft FORTRAN	4.0	MS-DOS	B
WATCOM WATFOR-77	3.0	MS-DOS	A
Pascal			
MPW Pascal	2.0.2	Macintosh	C
TURBO Pascal	—	MS-DOS	B
Tools			
ResEdit	1.2d0	Macintosh	B
HyperCard	1.2.1	Macintosh	A
Macintosh Programmer's Workshop	2.0.2	Macintosh	B
WATCOM GKS	1.3	MS-DOS	B
Communications			
File Transfer & Terminal Emulators			
Kermit	0.8(35)	Macintosh	A
Kermit	2.30	MS-DOS	A
Kermit	—	Apple II DOS	C
Kermit	—	CP/M	C
DeskLink	2.21c	MS-DOS	B
Lap-Link Mac	2.0	Macintosh	B
Lap-Link PC	2.16	MS-DOS	B
MacTerminal	2.2	Macintosh	B
PC TALK3	—	MS-DOS	C
PC PLOT III	—	MS-DOS	C
ProComm	TU 2.4.2	MS-DOS	A
Red Ryder	10.3	Macintosh	B
Remote[2]	1.01	MS-DOS	B
Network Systems			
AppleShare	2.0.1	Macintosh	B
Novell Advanced Netware	2.15	MS-DOS	B
STARLAN	3.1	MS-DOS	B
Tapestry II	1.1B	MS-DOS	A
TOPS	2.1	Macintosh	B
TOPS	2.1	MS-DOS	B
TOPS NetPrint	2.1	MS-DOS	B
Network System Utilities			
3COM PLUS	1.3.1	MS-DOS	B
Inter•Poll	1.0	Macintosh	B
PC LAN	1.3	MS-DOS	B
Database Managers			
4th Dimension	Int. 1.03	Macintosh	B
Archivist	1.02b	MS-DOS	B
AskSam	3.03	MS-DOS	B

Software List continued

Package/Compiler	Version	Environment	Support
Clipper	S87	MS-DOS	B
DATAEASE	2.5R3	MS-DOS	B
dBASE IV	1.0	MS-DOS	A
FoxBASE Mac	2.0	Macintosh	B
Notebook II	2.03	MS-DOS	C
R & R Report Writer	3.0	MS-DOS	C
Desktop Publishing			
Fontographer	n/a	Macintosh	C
PageMaker	3.01	Macintosh	A
PageMaker	3.0	MS-DOS	A
Ready Set Go	4.0	Macintosh	C
Ventura	2.0	MS-DOS	B
XPress	1.0	Macintosh	C
Electronic Mail			
Microsoft Mail	1.36	Macintosh	B
QuickMail	1.0	Macintosh	B
Graphics			
Charting			
35mm Express	4.02	MS-DOS	B
Cricket Graph	1.2	Macintosh	C
Freelance Plus	3.0	MS-DOS	B
Harvard Graphics	2.1	MS-DOS	B
Lotus 1-2-3	2.01a	MS-DOS	B
Microsoft Excel	1.5	Macintosh	B
Microsoft Excel	2.0	MS-DOS	B
SigmaPlot	—	MS-DOS	C
Draw and CAD			
Aldus Freehand	1.0	Macintosh	B
Cricket Draw	1.1	Macintosh	C
Generic CADD	3.0	MS-DOS	C
MiniCad	4.05	Macintosh	C
Illustrator	1.0	Macintosh	B
Illustrator88	1.6	Macintosh	B
MacDraft	1.2b	Macintosh	C
MacDraw	1.95	Macintosh	A
MacDraw II	1.0v1	Macintosh	B
Windows Draw	1.02	MS-DOS	C
Image and Scanning			
Corel Draw	1.00	MS-DOS	B
ImageStudio	1.05	Macintosh	B
Publish Pac	2.0	Macintosh	B
Publish Pac	2.1	MS-DOS	B
Text Pac	2.0	MS-DOS	B
Paint			
DR HALO	1.23	MS-DOS	C
MacPaint	2.0	Macintosh	A
Microsoft Paintbrush	2.0	MS-DOS	C
PC Paintbrush	2.5	MS-DOS	C
SuperPaint	1.1	Macintosh	B
Windows Paint	2.03	MS-DOS	C
Plotting Subroutines			
WATCOM GKS	1.3	MS-DOS	B
Numerical			
Derive	1.14	MS-DOS	C
Eispack	n/a	MS-DOS	C

Software List continued

Package/Compiler	Version	Environment	Support
Eureka	n/a	MS-DOS	C
GAUSS	2.0	MS-DOS	B
Linpack	n/a	MS-DOS	C
MathCAD	2.0	MS-DOS	C
muMATH-83	4.12	MS-DOS	C
NAg Workstation Library	Rel. 1	MS-DOS	A
Solver-Q	---	MS-DOS	C
Operating Systems			
IBM PC, PS/2, and compatibles			
AIX PS/2 (Unix)	1.1	n/a	C
IBM OS/2 Extended	1.1	n/a	B
IBM PC-DOS	4.0	n/a	B
Microsoft MS-DOS (incl IBM PC-DOS)	3.3	n/a	A
Microsoft Windows 286	2.1	MS-DOS	A
Microsoft Windows 386	2.1	MS-DOS	A
Macintosh II, Macintosh SE, and Macintosh Plus			
A/UX (Unix)		n/a	C
Finder	6.1	n/a	A
MultiFinder	6.0.1	n/a	A
System	6.0.2	n/a	A
NeXT			
NeXT	0.9	n/a	B
Apple II			
Apple II DOS	3.3	n/a	C
CP/M	2.20	n/a	C
ProDos	1.0	n/a	C
Sound			
SoundWave	1.0	Macintosh	B
MacRecorder	1.0	Macintosh	B
Spreadsheet			
HAL	1.0	MS-DOS	B
Lotus 1-2-3	2.01a	MS-DOS	B
Microsoft Excel	1.5	Macintosh	B
Microsoft Excel	2.0	MS-DOS	B
Statistical			
BASS	88.10	MS-DOS	C
MACSPIN	1.5	Macintosh	C
Minitab	82.1.1	MS-DOS	C
PowerStat	1.04	MS-DOS	C
SAS/PC	6.03	MS-DOS	A
SPSS/PC+	3.0	MS-DOS	A
STATPRO	2.0c	MS-DOS	C
STATWORKS	1.2	Macintosh	B
SYSTAT	3.2	Macintosh	B
SYSTAT	3.2	MS-DOS	B
Word Processing			
Guide	2.0	MS-DOS	C
FinalWord II	2.0	MS-DOS	C
MacWrite	5.01	Macintosh	B
Manuscript	2.0	MS-DOS	C
Microsoft Word	3.02 & 4.0	Macintosh	A
Microsoft Word	4.0 & 5.0	MS-DOS	A

Software List continued

Package/Compiler	Version	Environment	Support
Nota Bene	3.0	MS-DOS	B
Nota Bene SLS	3.0	MS-DOS	B
PC-TeX	2.1	MS-DOS	B
Sprint	1.0	MS-DOS	B
T^3	—	MS-DOS	C
WordPerfect	4.2 & 5.0	MS-DOS	A
WordPerfect	1.0	Macintosh	C
WordPerfect Library	2.0	MS-DOS	C
WordStar	3.3	MS-DOS	C
Utilities			
Apple Turnover	—	MS-DOS	A
Fastback MAC	2.0	Macintosh	B
Fastback Plus	2.0	MS-DOS	B
Norton Utilities	4.5	MS-DOS	A
Copy II MAC	7.2	Macintosh	B
Mace Utilities Gold	—	MS-DOS	B
MacZap	5.1	Macintosh	B
Sidekick for PM	1.0	OS/2	C
TURBO Lightning	—	MS-DOS	C
XenoCopy PC	1.117	MS-DOS	A
386MAX	4.0	MS-DOS	B

Software List continued

SOFTWARE LIST
for
MAINFRAME
COMPUTERS
VM/CMS, UNIX

Each programming language or package available at UTCS has a support level. In general, Class A Products receive full support, Class B limited support (as time and resources allow), Class C no active support.

For complete details of UTCS product support policy, see the UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction.

Package/Compiler	System	Support	Version
Communications			
FTP	VM/CMS	C	1.2.1
Kermit	VM/CMS	A	---
Kermit	UNIX	B	4C(058)
FTS	VM/CMS	A	---
MAIL/MAILBOOK	VM/CMS	A	86.359
MICROLASER	VM/CMS	A	---
macget/macput	UNIX	C	---
netcopy, netexec, to (NetNorth Tools)	UNIX	B	---
xmodem	UNIX	C	---
ftp,rsh,rlogin,telnet,rcp (Access via TCP/IP to most of the networked machines on all three campuses)	UNIX	B	---
rn/Pnews	UNIX	B	---
mail,mh,Mail	UNIX	-	---
TELNET	VM/CMS	C	1.2.1
Graphics			
PLOTBASIC (FORTRAN)	VM/CMS	C	---
SAS/GRAPH	VM/CMS	A	5.18
Languages			
ASSEMBLER(F)	VM/CMS	C	---
Concurrent Euclid	VM/CMS	C	1.9
FORTUTILS	VM/CMS	A	2.2
PL/I OPT Compiler	VM/CMS	B	1.5.1
REXX	VM/CMS	A	---
SNOBOL 4	VM/CMS	C	3.5
Turing	VM/CMS	C	---
VS FORTRAN	VM/CMS	A	1.4.1
VS Pascal	VM/CMS	C	2.2
Waterloo C	VM/CMS	C	1.3
WATFIV	VM/CMS	C	V2L0
WATFOR-77	VM/CMS	A	1.3
cc	UNIX	A	---
f77	UNIX	C	---
ratfor	UNIX	C	BSD std.
ttc	UNIX	C	---
pc	UNIX	C	BSD std.
yacc	UNIX	C	---
awk	UNIX	C	---
adb,dbx	UNIX	C	BSD std.
Numerical			
IMSL	VM/CMS	A	9.2,10.0
LINPACK	VM/CMS	C	---
MINOS	VM/CMS	C	5.1
MINPACK	VM/CMS	C	---
NAg	VM/CMS	A	Mark 11, 13
Statistical			
BMDP	VM/CMS	A	Level 85, Level 87
Minitab	VM/CMS	B	5.1
NAg	VM/CMS	A	Mark 11, 13
NTSYS	VM/CMS	C	1987
SAS	VM/CMS	A	5.18
SPSS^x	VM/CMS	A	3.1

Software List continued

Package/Compiler	System	Support	Version
Text Processing			
SCRIBE	VM/CMS	C	4(1400)-1
Waterloo SCRIPT	VM/CMS	B	86.1
XEDIT	VM/CMS	A	---
8700 Pseudotypesetting	VM/CMS	C	n/a
MICROLASER	VM/CMS	A	---
ed	UNIX	A	---
vi	UNIX	C	---
cmacs	UNIX	C	---
spell	UNIX	C	---
diction/explain	UNIX	C	---
eqn	UNIX	B	---
tbl	UNIX	B	---
pic	UNIX	C	---
troff	UNIX	B	---
nroff	UNIX	B	---
TeX	UNIX	C	---
Utilities			
FORTUTILS	VM/CMS	A	2.2
TPRINT	VM/CMS	C	---
TCOPYNL	VM/CMS	B	---
TCOPYSL	VM/CMS	B	---
crypt	UNIX	A	BSD std.
compress	UNIX	C	BSD std.
csh	UNIX	B	BSD std.
diff	UNIX	A	BSD std.
grep	UNIX	A	BSD std.
ipr	UNIX	B	---
learn	UNIX	C	BSD std.
patch	UNIX	C	---
sed	UNIX	A	BSD std.
sort	UNIX	A	BSD std.
sh	UNIX	A	BSD std.
tar	UNIX	A	BSD std.
uniq	UNIX	A	BSD std.

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